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ABSTRACT

Since its inception in 1988, the Board on International Comparative Studies in Education (BICSE) has monitored U.S. participation in those cross national comparative studies in education that are funded by its sponsors, the National Science Foundation and the National Center for Education Statistics. This set of international study descriptions represents a status report on 17 projects presented to BICSE at various times in 1994. Reports were prepared by the projects themselves and are presented without evaluation or editing. The following are described: (1) "Case Studies of U.S. Innovations in Mathematics, Science, and Technology in an International Context" (National Center for Improving Science Education and other agencies); (2) "Civics Education Study" (International Association for the Evaluation of Educational Achievement); (3) "Comparative Study of Teacher Training and Professional Development Practices in APEC (Asia Pacific Economic Co-operation) Members" (Asia Pacific Economic Co-operation Ministerial); (4) "Computers in Education Study" (International Association for the Evaluation of Educational Achievement [IEA]); (5) "Cross-national Studies of Adult Understanding of Science" (Chicago Academy of Sciences); (6) "Education Indicators Project (INES)" (Organization for Economic Cooperation and Development); (7) "International Adult Literacy Study" (Statistics Canada); (8) "International Assessment of Educational Progress" (Educational Testing Service); (9) "International Comparative Study of Mathematics and Science Tests" (National Center for Improving Science Education); (10) "International Study of Teachers' Attitudes toward Reform and Teacher Preparation for Implementing Reform" (George Washington University Institute for Curriculum Standards and Technology); (11) "Language Education Study" (IEA); (12) "New Standards Project (benchmark activities)" (Learning Research and Development Center at the University of Pittsburgh and National Center on Education and the Economy); (13) "Preprimary Project" (IEA); (14) "Reading Literacy Study" (IEA); (15) "Study on Performance Standards in Education" (U.S. Department of Education); (16) "Survey of Mathematics and Science Opportunity" (Michigan State University); and (17) "Third International Mathematics and Science Study (TIMSS) (including special U.S. TIMSS activities)" (IEA). (SLD)

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# *International Comparative Studies in Education: Descriptions of Selected Large-Scale Assessments and Case Studies*

**Board on International Comparative Studies in Education**
**Commission on Behavioral and Social Sciences and Education**
**National Research Council**

**2101 Constitution Avenue, Harris 178, Washington, D.C. 20418, U.S.A.**
**Telephone: 1-202-334-3010 Facsimile: 1-202-334-3584**

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# *International Comparative Studies in Education:*

# *Descriptions of Selected Large-Scale Assessments and Case Studies*

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**Board on International Comparative Studies in Education**
**Commission on Behavioral and Social Sciences and Education**
**National Research Council**

*Winter 1994-95*

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The work of the Board on International Comparative Studies in Education is supported with funds from the National Science Foundation and the National Center for Education Statistics, through a grant from the National Science Foundation.

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**Board on International Comparative Studies in Education**
**Commission on Behavioral and Social Sciences and Education**
**National Research Council**

# *International Comparative Studies in Education: Descriptions of Selected Large-Scale Assessments and Case Studies*

***Winter 1994-95***

Interest in education abroad and how it compares to schooling in the United States has been rising among policy makers, researchers, and practitioners. Since its inception in 1988, the Board on International Comparative Studies in Education (BICSE) has monitored U.S. participation in those cross-national comparative studies in education that are funded by its sponsors, the National Center for Education Statistics and the National Science Foundation. It has also provided a forum for information and discussion, which has led it to request presentations on selected additional studies of special interest to the board and its sponsors.

As a result, BICSE has in its records information about the aims, designs, and intended outcomes of a number of the largest international studies in education that have been undertaken in recent years. BICSE's collection clearly does not cover all or even a representative sampling of the broad range of studies available on comparative and international education issues. Nevertheless, BICSE's accumulated information represents a valuable resource on a variety of studies, a compilation that is not available elsewhere. Participants at the Second International Conference on Long-Range Planning for Large-Scale Collections of International Education Statistics convened by BICSE in January 1993 urged BICSE to make such international study information available to interested individuals in the United States and in other countries as well.

This set of international study descriptions represents a status report on 17 projects presented to BICSE. The study descriptions were compiled by Jane Phillips of the BICSE staff from information submitted to the board by each project's staff; each compilation was then submitted to its respective project director for editing and updating. These updates were accomplished at various times in 1994, as indicated in the individual project descriptions. BICSE has not evaluated or edited the descriptions, but merely presents them as reports by the projects themselves on their activities. Each study description indicates key contact persons for that project who can provide further information and subsequent updates on progress and findings.

The Board on International Comparative Studies in Education has a limited number of copies of this collection of descriptions for complementary distribution. (2101 Constitution Avenue, Harris 178, Washington, D.C., 20418, U.S.A.; telephone: 1/202/334-3010; facsimile: 1/202/334-3584)

The document will also be made available on Internet through World Wide Web. It may be accessed by using the World Wide Web address. (http://www.nas.edu/)

The U.S. Department of Education Educational Resources Information Center (ERIC) will have the document on microfiche. (ERIC, 1301 Piccard Dr., Suite 300, Rockville, Maryland 20850-3238, U.S.A.; telephone: 1/301/258-5500)

## *INTERNATIONAL COMPARATIVE STUDIES IN EDUCATION: DESCRIPTIONS*


***Case Studies of U.S. Innovations in Mathematics, Science, and Technology in an International Context*** 3
The National Center for Improving Science Education, National Center for Research in Mathematical Sciences Education, and Center for Educational Research and Innovation (CERI/Organisation for Economic Co-operation and Development)

***Civics Education Study*** 7
International Association for the Evaluation of Educational Achievement

***Comparative Study of Teacher Training and Professional Development Practices in APEC Members*** 12
Asia Pacific Economic Co-operation Ministerial

***Computers in Education Study*** 15
International Association for the Evaluation of Educational Achievement (IEA)

***Cross-national Studies of Adult Understanding of Science*** 23
Chicago Academy of Sciences

***Education Indicators Project (INES)*** 29
Organisation for Economic Cooperation and Development

***International Adult Literacy Study*** 42
Statistics Canada

***International Assessment of Educational Progress*** 48
Educational Testing Service

***International Comparative Study of Mathematics and Science Tests*** 58
The National Center for Improving Science Education

***International study of teachers' attitudes toward reform and teacher preparation for implementing reform*** 62
George Washington University Institute for Curriculum Standards and Technology

***Language Education Study*** 65
International Association for the Evaluation of Educational Achievement (IEA)

***New Standards Project (benchmark activities)*** 74
Learning Research and Development Center at the University of Pittsburgh and National Center on Education and the Economy

***Preprimary Project*** 79
International Association for the Evaluation of Educational Achievement (IEA)

*Reading Literacy Study* 89
International Association for the Evaluation of Educational Achievement (IEA)

*Study on Performance Standards in Education* 97
U.S. Department of Education, Office of the Under Secretary and the Organisation for Economic Cooperation and Development

*Survey of Mathematics and Science Opportunity (SMSO)* 101
Michigan State University

*Third International Mathematics and Science Study (TIMSS) (including special U.S. TIMSS activities)* 106
International Association for the Evaluation of Educational Achievement (IEA)

## *DESCRIPTIONS*

## *CASE STUDIES OF U.S. INNOVATIONS IN MATHEMATICS, SCIENCE, AND TECHNOLOGY IN AN INTERNATIONAL CONTEXT*

***International Organization*** The National Center for Improving Science Education, National Center for Research in Mathematical Sciences Education, Stanford University, and Center for Educational Research and Innovation (CERI/Organisation for Economic Co-operation and Development)

***Years of Data Collection*** Phase One -- 1991-92
Phase Two -- 1992-95

***Purpose*** The outcome of this two-phase study will be eight intensive case studies on mathematics and science innovations, the United States' contribution to an international effort. The project examines how innovations in science and mathematics occur around the world. The idea for international case studies of innovation in science, mathematics, and technology education grew out of CERI/OECD member nations' growing concerns for more effective mathematics, science, and technology education programs to serve their populations. They recognized the need to have an in-depth understanding of the policies, programs, and practices that lead to successful innovations in science and mathematics education. Further, they desired a greater understanding of how these innovations in programs, policies, and practices are implemented in different countries and settings. Approaches to reforming education developed in one country may be very helpful to educators elsewhere.

***Organization and Management*** Coordinated by the Center for Educational Research and Innovation (CERI/Organisation for Economic Co-operation and Development [OECD]), the National Center for Improving Science Education has the responsibility for the science case studies; the National Center for Research in Mathematical Sciences Education has responsibility for the mathematics studies. Phase Two will be carried out by the National Center for Improving Science Education, the National Center for Research in Mathematical Science of the Wisconsin Center for Education Research, and Stanford University. Project staff include The National Center for Improving Science Education director and project director, a subcontractor director, and senior research scientists (Michael Huberman, Mary Budd Rowe, Myron Atkin, Jeremy Kilpatrick, and Doug McLeod).

The project includes a subcontract for OECD to catalyze and monitor the data collection in each of the participating member countries during their own national studies. Although many more countries participated in Phase One, OECD will attempt to hold the number of countries participating in Phase Two to six to eight to facilitate quality control. OECD's monitoring will be carried out through science and mathematics education specialists and will be directed toward tailoring the case studies to meet the methodological requirements of the project and to ensure that questions of common interest are addressed in each country.

***Design***

***Participants*** Phase One -- OECD member countries.

Phase Two -- Six to eight OECD member countries.

***Sample*** In the main, sampling is based on selecting sites/events that illustrate particularly interesting theoretical or applied issues.

*Procedures and Summary of Content*

**Phase One.** The scope of work for Phase One entailed selecting the U.S. innovations and writing 20-page case summaries. To complete this work, the following specific activities took place:

- An advisory board was established consisting of the U.S. representatives to the several planning meetings held by CERI/OECD and added members, including science, mathematics, and case study methodology experts. The advisors will continue to provide guidance throughout Phase Two of the study.

- The staff and advisory board finalized the selection of the innovations that were to be described in Phase One. The innovations selected were: California's Systemic Improvement of Science Education; Chemistry in the Community (ChemCom); Kids Network; Project 2061; State of California's Restructuring of Mathematics Education; The National Council of Teachers of Mathematics Standards Project; The Urban Mathematics Collaborative Project; and The Voyage of the Mimi.

- The advisory board met to review the papers produced in Phase One and further refine the plans for the in-depth case studies to be carried out in Phase Two. The California mathematics project was dropped and Contemporary Pre-Calculus Through Applications added. The Phase One papers were revised based on advisory board suggestions and have been published by OECD for international distribution.

**Phase Two.** The work of Phase Two is to document the philosophy, genesis, implementation and, in some cases, routinization of major innovations in science, mathematics, and technology education. A case study design provides for common issues to be explored and analyzed while still paying attention to the unique features of the individual case.

*Data Collection and Analyses*

**Phase Two:** The overall approach for the international study is based on the work of Robert Yin (1984), Michael Huberman, and Matt Miles (1984), and informed by the work of Robert Stake and Jack Easley (1978). Comprehensive, systematic, and in-depth information will be collected through field observations guided by the same general questions. However, different methods of inquiry and analyses will be used to reveal the most salient features of each of the innovations.

The case study research will follow events and processes over time, reconstituting milestones that occurred before the researchers picked up the case and carefully documenting unfolding events through a variety of modes. Some of the research questions will have to be general, covering all cases, and others will be project-specific.

Michael Huberman has developed a model to guide sampling, collecting, and coding data, carrying out an intermediate analysis, and conducting the final analysis and write-up. For each project, research questions will be grouped, and the coded segments used to respond to each, including illustrative material in the form of excerpts, vignettes, and composite sketches. Alternatively, major themes, leitmotifs, dilemmas, and achievements can be explicated across research questions for each project. Each case will constitute a narrative, with the research questions converted into chapters and the main findings presented at their proper chronological moment. The case studies will not exceed 80 pages each with a three page synopsis. The field research teams will develop, review, and critique

case outlines prior to final write-up; the write-ups also will be reviewed by a small group of critical readers. There also will be a cross-project analysis.

***Timetable***

| | |
|---|---|
| Phase One: | (October 1991 to October 1992) |
| 1991-1992 | An advisory board was established; the staff and advisory board finalized the selection of innovations to be described in Phase One.<br>The advisory board reviewed Phase One papers and refined plans for Phase Two in-depth case studies.<br>Phase One papers were revised and published. |
| Phase Two: | (September 1992 to September 1995) |
| 1992-1995 | Information will be collected through field observations.<br>Case study narratives will be published.<br>A cross-project analysis will be published. |

***Publications*** Phase One papers have been published by OECD for international distribution.
Phase Two case study narratives will be published.
A cross-project analysis will be published.

***Funding*** Phase One and Phase Two funding is provided by the National Science Foundation and the U.S. Department of Education.

***Information Sources***

Senta A. Raizen, Director
The National Center for Improving Science Education
2000 L Street, N.W., Suite 603
Washington, D.C. 20036
telephone: 202/ 467-0652
facsimile: 202/ 467-0659
Bitnet: sentar@gwuvm.gwu.edu

Ted Britton, Project Director
The National Center for Improving Science Education
2000 L Street, N.W., Suite 603
Washington, D.C. 20036
telephone: 202/ 467-0652
facsimile: 202/ 467-0659
e-mail: tbritton@gwuvm.gwu.edu

Norman Webb, Senior Researcher
National Center for Research in Mathematical Sciences Education
Wisconsin Center for Education Research
School of Education, University of Wisconsin-Madison
Madison, Wisconsin 53706
telephone: 608/ 263-4287
facsimile: 608/ 263-6448
e-mail: normwebb@vms.mace.wisc.edu

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Organisation for Economic Cooperation and Development
1993 Science and Mathematics Education in the United States: Eight Innovations. Publication number 96-93-01-1. OECD, Paris, France. (Available from OECD Publications, Washington, D.C.)

Raizen, Senta
1992 Case Studies of U.S. Innovations in Mathematics, Science, and Technology in an International Context. Presentation to the Board on International Comparative Studies in Education. October.

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NOTE: This study summary was reviewed and edited by Ted Britton at The National Center for Improving Science Education in Washington, D.C. on May 31, 1994.

## *CIVICS EDUCATION STUDY*

***International Organization*** International Association for the Evaluation of Educational Achievement (IEA)

***Years of Data Collection*** Case studies: 1995-1996
Data collection: 1997-98

***Purpose*** IEA conducted a Civic Education Survey in 1971 as part of a Six-subject Survey of student achievement (science, reading comprehension, literature, French as a foreign language, English as a foreign language, and civics education). Ten IEA member countries participated in the civics education portion. Extensive regression analysis was conducted, with a fairly consistent finding that stress on rote learning and on patriotic ritual within the classroom tended to be negatively related to civics education outcomes, while the opportunity to express an opinion in class had a positive relationship. The socioeconomic status of the family and the type of school (academic or vocational) were controlled statistically in the regression analysis, and these findings were extremely similar across nine Western industrialized countries with different educational and political contexts.

Since 1971, many changes have taken place in schools and political systems, which raise new issues and intensify concern for old ones. Needs and opportunities for a second civics education study are:

- Moves toward democratization around the world
- Increasing immigration/emigration and resurgent authoritarianism and racism
- Alienation among youth and the growth of what has been called "unconventional participation"
- Recognition of the implicit or hidden curriculum
- Wariness concerning discussions of civics and political
- Women's increasing role in politics
- Prominent environmental issues
- Powerful mass media

In addition, there have been advances in the social sciences, educational measurement, and the methodologies and models used by IEA that provide a background for a second study.

Many differences exist around the world in the content and process of civics education. In societies undergoing rapid social and political change and democratization attempts are being made to prepare young people for a political and economic order that does not yet exist. Civics education differs from many other school subjects in the relative lack of consensus even within societies with long democratic traditions about the knowledge and attitude base, but even more in countries where individuals are wary of pleas for national unity and of courses with titles such as civics or political education. Cross-national research has a vital role in providing the research base for policy makers, those who design curricula, those who prepare teachers, and the general public.

***Organization and Management*** An international coordinating center will be designated through competitive bidding for Phase II to begin operations in mid-1996. Until then, Phase I and planning for Phase II will take place through ad hoc planning groups as part of a special project involving IEA headquarters.

## *Design*

### *Participants*

**Six-subject Survey - civics education:** Finland, Germany (Federal Republic), Iran, Ireland, Israel, Italy, Netherlands, New Zealand, Sweden, and the United States. (1971)

**Civics Education Study:** There is high interest in a civics education study in countries of Central and Eastern Europe and Asia, and in countries that belong to the Organisation for Economic Co-operation and Development. (1994-2000)

### *Sample*

**Six-subject Survey - civics:** The aims of the research were to identify those factors accounting for differences between countries, between schools, and between students. The technique used was a cross-sectional survey at three different levels, which described education as it was at the time of testing and not as it might be. Probability samples of schools and students within schools were drawn for each level within each country.

**Civics Education Study:**

Phase I: In some countries, structured interviews will be conducted with small samples of students.

Phase II: The survey of knowledge, attitudes, and participation or behavior will be conducted with nationally representative samples.

## *Procedures and Summary of Content*

**Six-subject Survey - civics:** Three international populations were identified: Population I included all students in full-time schooling aged 10:0-10:11 years; Population II included all students in full-time schooling aged 14:0-14:11 years; and Population IV encompassed all students in the terminal year of full-time secondary education programs that were either pre-university programs or programs of the same length. A Population III was designed for national data collection and analysis only. Tests were developed to yield a total "cognitive" score. There were survey scales to measure attitudinal outcomes as well as perceptions about "how society works."

**Civics Education Study:**

Phase I. Each participating country will prepare a case study of its civics education, including reviews of previous empirical and policy studies, interviews, and analysis of curricula, to gather:

- information about the political, educational, social, and economic context with special attention to major recent changes or reforms, including some social indicators
- conceptions of and definitions related to civics education, including both official statements such as national curricula or assessment standards, and other major points of view
- information about content and methods of civics education as it is practiced, centered on intended and like unintended learning outcomes of civics education and how it is envisioned that these outcomes will be achieved by students

- a perspective concerning other factors influencing the civics education process and its outcomes, such as educational policy more generally, school organization, media, parental, and family characteristics

Among the sources to be used are:

- analysis of curriculum and policy documents in areas such as national and world history, civics, social studies, moral education, literature, as well as participation opportunities provided to students in and out of schools
- interviews (individually or in focus groups) with policy makers, leaders in professional organizations such as teachers unions and experts in teacher training
- in some countries structured interviews with small samples of students either individually, in focus groups, or using computer networks
- review of existing studies conducted within the country of civics education, moral education, youth and adult attitudes, and political socialization

The national case studies will be conducted around a common framework prepared by an international committee. Each participating country will make a proposal to this international committee with respect to the types of material they intend to collect for the self-study and how it will be analyzed. The international committee will make suggestions about this material and nominate out-of-country experts to examine the resulting data and self-study report in order to give advice to the national team. The national team will retain responsibility for the report itself, and the external panel will prepare a report documenting its own views. The case studies and commentaries will be prepared for publication, and will also produce guidance for Phase II of the study, with respect to topics to be considered, aspects of formal and informal education to be surveyed, outcomes, and predictors.

Phase II. The second phase will be a survey of knowledge, attitudes, and participation or behavior in nationally representative samples. It will be designed around issues and processes and programs currently in place and questions of high interest and relevance in participating countries. A conceptual framework for Phase II will emerge from the Phase I case studies.

***Data Collection and Analyses***

Under development as part of Phase II planning.

***Timetable***

1993 A paper outlining needs and opportunities of a civics education study was presented to the General Assembly (September).

1994 An international group of experts met to discuss and formulate aims and design of the study.
A proposal was drafted for approval at IEA General Assembly in August. General Assembly approved the study with Phase I to be identified as the IEA Civics Education Project.

1995-1999
The two-phased study will be conducted.

1995-1996
Phase I will be conducted -- National Case Study Profiles and plan for Phase II.

1997-1999
Phase II will be conducted -- large-scale survey, probably of 14-year-olds.

1998 Phase II data will be collected.

***Publications***

Civics Education Study Phase I: National case study profiles of nations and systems will be assembled in a publication; curriculum analysis, multi-media analysis (e.g. interactive interviews with students, videos) may be included.

Civics Education Study Phase II: Large-scale survey design, methodology, sampling; questionnaires; and multi-media reports will be produced.

***Funding*** In Phase I The National Center for Education Statistics will contribute a modest amount of funding for the international costs; most of the funding for international costs is expected to come from outside the United States.

***Information Sources***

International Association for the Evaluation of Educational Achievement (IEA) Secretariat
c/o SVO
Sweelinckplein 14
2517 GK The Hague THE NETHERLANDS
telephone: 31-70-346-96-79
facsimile: 31-70-360-99-51
e-mail: iea@svo.nl

Judith Torney-Purta, Ph.D., International Project Coordinator of Phase I
and Planning Committee Chair
Professor of Human Development
Benjamin Building 3304, University of Maryland
College Park, Maryland 20742
telephone: 301/ 405-2806
facsimile: 301/ 405-2891
electronic mail: JT22@umail.umd.edu

Gordon M. Ambach, Liaison to IEA
Council of Chief State School Officers
One Massachusetts Ave., N.W., Suite 700
Washington, D.C. 20001-1431
telephone: 202/ 408-5505
facsimile: 202/ 408-8072
e-mail: gambach@nas.edu

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Torney-Purta, J., and J. Schwille

1986 Civic values learned in school: Policy and practice in industrialized countries. *Comparative Education Review*. 30:30-49

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NOTE: This study summary was reviewed and edited by William Loxley at the International Association for the Evaluation of Educational Achievement in The Hague on June 9, 1994, and by Judith Torney-Purta and Gordon Ambach in Washington, D.C. on October 3, 1994.

## *COMPARATIVE STUDY OF TEACHER TRAINING AND PROFESSIONAL DEVELOPMENT PRACTICES IN APEC MEMBERS*

***International Organization*** Asia-Pacific Economic Cooperation

***Years of Data Collection*** 1993

***Purpose*** The Asia-Pacific Economic Cooperation (APEC) was formed in 1989 as a new mechanism for multilateral cooperation among the economies of the Asia-Pacific region. Its members are Australia, Brunei Darussalam, Canada, Chile, the People's Republic of China, Hong Kong, Indonesia, Japan, the Republic of Korea, Malaysia, Mexico, New Zealand, Papua New Guinea, the Republic of the Philippines, Singapore, Chinese Taipei, Thailand, and the United States. APEC aims to sustain growth, development, and improved living standards in the Asia-Pacific region and the world, and to promote free trade. APEC provides a forum for ministerial discussion on a broad range of issues related to these goals.

In August 1992, education ministers and senior officials from the APEC member countries met in Washington, D.C. to agree on activities and goals for a new APEC Education Forum. An education symposium was held immediately prior to the ministerial meeting to provide an opportunity for: exchange of ideas on designing schools for the 21st century; development of standards for curricula and assessment; and teacher development -- standards and reform.

The Comparative Study of Teacher Training and Professional Development Practices in APEC Members is one of several cooperative activities undertaken by the Education Forum. As APEC members develop or revise national standards in specific curriculum subjects, and standards for teacher education, they will also need to revise standards for teacher education.

***Organization and Management*** The U.S. Department of Education is coordinating this study in which twelve APEC countries are participating (including the United States). Linda Darling-Hammond and Velma Cobb of the National Center for Restructuring Education at Teachers College, Columbia University are the principal investigators. Harold Stevenson of the University of Michigan has been commissioned to write a brief literature review and is one of six members of an advisory panel.

***Design***

> ***Participants*** The twelve participating APEC members are: Australia, Brunei, Canada, People's Republic of China, Hong Kong, Japan, Republic of Korea, Malaysia, New Zealand, Singapore, Chinese Taipei, and the United States.

***Procedures and Summary of Content*** The participating APEC countries have submitted papers that describe their teacher training and professional development practices. These papers were based on a standard research framework. A second draft of the literature review has been completed and circulated to Forum members; a draft analysis overview also has been completed.

***Data Collection and Analyses*** The edited descriptive papers, a brief literature review, and an analytic overview paper that seeks to draw out the most important findings from a review of the member papers will be published in late 1994, after member approval.

***Timetable***

1992 Education ministers and senior officials of APEC member countries met in Washington, D.C. and agreed to establish an Education Forum to engage in joint cooperative activities and ongoing dialogue on key education policy issues. (August)

1993 The U.S. delegation to APEC presented a draft research framework. (May)

1994 Twelve participating countries provided papers describing teacher training and professional development practices. (January)
A brief commissioned literature review was completed. (May)
An analytic overview paper was drafted. (May)
Members will submit comments on the papers. (July)
Papers, overview, and literature review will be published. (Fall)

***Publications***

A volume containing papers that describe individual APEC members' teacher training and professional development practices, an analytic overview of the papers, and literature review will be published. (1994)

***Database*** No data base is available to the public at this time.

***Funding*** The U.S. Department of Education and APEC member education ministries provide funding for this study.

***Information Sources***

Alan Ginsburg, Director
U.S. Department of Education Planning and Evaluation Service
400 Maryland Avenue, S.W., Room 3127
Washington, D.C. 20202
telephone: 202/ 401-3132
facsimile: 202/ 401-3036

Asia Pacific Economic Cooperation

1992 Declaration of the APEC Education Ministerial. EF1.
1992 Education Standards in the Asia-Pacific Region. EF2.
1992 Proceedings of the APEC Education Ministerial. EF3.
1993 Papers Presented at the Symposium on Education in the APEC Region. EF4.
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NOTE: This study summary was reviewed and edited by Lenore Garcia at the U.S. Department of Education Office of the Under Secretary, Planning and Evaluation Service in Washington, D.C. on July 12, 1994; database information was provided by Lenore Garcia on February 17, 1995.

## *COMPUTERS IN EDUCATION STUDY*

| | | |
|---|---|---|
| ***International Organization*** | International Association for the Evaluation of Educational Achievement (IEA) | |
| ***Years of Data Collection*** | Stage I: | 1988-1989 |
| | Stage II: | 1991-1992 |

***Purpose*** To assess to what extent, and how computers are used in education; to study the effects and changes that are taking place over time; and to look at how different material conditions (such as hardware and/or software availability) as well as immaterial conditions (such as teacher training facilities or support structure) affect the implementation of the use of computers by educational practitioners.

In the history of education, the 1980's will stand out as the decade during which many countries throughout the world introduced computers in schools on a large scale. This technological innovation is not only unprecedented in its scope, but also in the controversies it raised. What is the place of computers in the curriculum? What are the potential and actual benefits of using computers as a tool in the instructional process? And which strategies prove to be beneficial in implementing computers in educational practice?

The Stage I survey was designed to provide answers to questions about trends in computer use, for example, in their distribution across subjects and departments. Are more science teachers able to simultaneously use more than the one or two computers that they typically had in 1985? Are more high school mathematics teachers using computers for classes in algebra, geometry, and trigonometry, instead of two-thirds of their instructional computing time going for programming and computer literacy classes, as in 1985? Are English classes now the major users of word processing programs, or is this use of computers still overwhelmingly a business education activity as it was in 1985? It also sought to be able to show whether there had been changes in the kinds of software and types of tasks students are engaged in at computers.

The survey was intended to address questions about the effectiveness of current U.S. implementations, regardless of their relevance in an international context. How much staff support for school-level implementations is there and how adequately trained is it? Are schools having problems allocating limited computer resources among competing departments whose interest in computers has been piqued, and among alternative uses made possible by the burgeoning variety of software? How much informal staff education and training goes on among teachers within the school building, and in what contexts does this occur most readily?

By the 1990s, computers have become a way of life in American schools. Ninety-nine percent of the elementary and secondary schools in the United States have installed computers, and 85 percent of the students use them during the school year. Each participating country in the Stage II Computers in Education Study administered an international test of practical computer knowledge, testing general concepts such as hardware and copy-protection, use of diskettes and software, and application of software (such as word processing, databases, and telecommunications).

The Stage II survey probed questions about what students learn about computers; how students use computers in school; what learning about computers takes place out-of-school; sex, race, and financial equity; how teachers cope with computers; and computer equipment in the schools.

***Organization and Management***

Stage I: The international coordinator and coordinating center were located at the University of Twente, Enschede, The Netherlands. The U.S. national project director and coordinating center were located at The Johns Hopkins University, Baltimore, Maryland. Data collection was subcontracted to Survey Research Associates in Baltimore, Maryland, a professional firm, selected by a competitive bid process. International and national steering committees provided guidance.

Stage II: The international coordinator and coordinating center were located at the University of Twente, Enschede, The Netherlands. The U.S. national project director and coordinating center were located at the University of Minnesota. U.S. data collection and processing was carried out by national project staff at the University of Minnesota and subcontracts with Westat, Inc. International and national steering committees provided guidance.

***Design***

***Participants*** Educational systems participating in the study are as follows:

Stage I: Austria, Belgium (Flemish), Belgium (French), Canada (British Columbia), China, France, Germany (Federal Republic), Greece, Hungary, India, Israel, Italy, Japan, Luxembourg, Netherlands, New Zealand, Poland, Portugal, Slovenia, Spain, Switzerland, United States.

Stage II: Countries for which data were collected and processed in time for the IEA reports for Stage II were: (populations listed after each country) Austria (2,3), Bulgaria (2,3), Germany (2), Greece (3), India (3), Israel (1,3), Japan, (1,2,3), Latvia (3), Netherlands (1,2), Slovenia (3), Thailand (3), and the United States (1,2,3). Two countries were incomplete participants in that they collected some data but did not complete the study due to problems of schedules or resources: Hungary and Italy.

***Sample***

Stage I: Three populations of schools formed separate universes for sampling and instrument development: schools containing (in the U.S.) grade 5, schools containing grade 8, and schools containing grade 12. The study data collection goal was to obtain data from 400 schools per population.

Stage II: Because the samples were selected using a complex probability sampling scheme, survey weights were needed to ensure that the sampled data could be used to make accurate inferences about the target populations. The U.S. samples of students and schools in Stage II were intended to support the following types of analysis: student-level analysis for the target population (what percentage of students in 5th, 8th, or 11th grade use computers extensively) and school-level analysis for each target population (what percentage of schools that offer the target grades use computers extensively in instruction).

***Procedures and Summary of Content*** The study is a two-stage survey. During the first stage (1987-1990), data were collected at school and teacher level. The second stage (data collection in 1992) consists of a partial replication of the data collection for Stage I to be able to study changes over time, and the collection of data on student level for assessing students' functional knowledge and skills with respect to new information technologies and their attitudes towards computers.

The instrumentation and respondents for Stages I and II of the study consist of questionnaires for school principals of computer-using as well as non-using schools, technically informed persons (usually the computer coordinator), and teachers of computer education courses. In Stage I samples of computer-using and non-using teachers of mathematics, science, and mother tongue were surveyed; this became an international option in Stage II.

Stage I: The United States participated along with 17 other countries and national regions in this study of the instructional uses of school computers. The survey provided data about how schools use computers to assist in traditional academic subjects as well as how they organize instruction on computer-specific subject-matter such as computer programming and word processing. It encompassed both elementary and secondary education, with a concentration on three specific age/grade cohorts -- defined as the modal grade in each country for students aged 10 (U.S. grade 5), 13 (grade 8), and the last year of secondary school (grade 12).

At the teacher level, the study focused on four particular subjects: mathematics, science, English ("mother tongue"), and computer education. Although itself only a survey of school and teacher practices, the survey was also preliminary to the effort planned for 1992 that would measure the effect of computer-based educational experiences on student achievements in computer-specific subject-matter (programming and computer literacy) and in traditional subjects (such as mathematics and science) where computers are used.

Besides its comparative function, the survey also served an important domestic data collection function for the United States, extending time-series data previously collected in 1983 and 1985 from national samples of schools and teachers in this country. By 1989 most U.S. schools had enough computers in single locations that entire classrooms of students could be served at one time -- a situation that did not prevail during previous school surveying.

Stage II: The international survey tested 69,000 students in grades 5, 8, and 11 in 2,500 schools on practical computer knowledge of general concepts such as the use of diskettes and software and the general features of common application software -- word processing, databases, and telecommunication. Computer programming was not tested. The U.S. portion of the study included 11,284 students in 573 schools.

***Data Collection and Analyses***

Stage II: Because funding was not provided until September 1992, the United States was unable to conduct a full scale pilot testing within the time schedule of the international coordinating center. Nevertheless, just before the national project coordinators meeting in September over 150 students in three different population groups were pilot tested, and that data was taken to the September NPC meeting. Thus, the U.S. data were combined quantitatively and qualitatively with the data from other countries at the meeting and in subsequent analyses. The U.S. pilot data was used extensively in the instrument development at the September NPC and international steering committee meetings.

The United States administered optional performance tests in grades 8 and 11. About 110 schools chose to participate and over 1,500 students completed the word processing performance test. Data from the follow-up surveys of students' test administrators were coded and assembled in data files for analysis.

At the April 1994 meetings of the American Educational Research Association Wayne Welch presented a paper on a longitudinal analysis of data using organizational factors to predict growth in the quantity and quality of educational computer utilization.

The national project team is preparing public data files and extensive associated documentation: coding, analysis, and reporting of performance assessment data; coordination with the IEA chair in preparation of the collection of national context articles describing the features of the educational system in each country; more detailed analyses of the data for academic journals; and preparation of a technical memo on equity issues arising from the national report.

An assessment of progress toward computer-related standards in mathematics and science education has been proposed. The data from the IEA study would be used to determine the extent to which U.S. students and schools are meeting the computer-related standards specified by the National Council for Teachers of Mathematics standards and the American Association for the Advancement of Science benchmarks for science literacy.

Production of a 60-minute video program has been proposed, using results from the international study. The video would be broadcast on national television in the United States and other countries. English and German language versions would be produced.

***Timetable***

Stage I:

1988-
1989 Data was collected.

Stage II:

1991-
1992 Data was collected.
National Project Coordinators met in Tokyo. (September)
National Steering Committee met. (November)

1992-
1993 Data was processed.

1993-
1994 Reports were prepared.

1993 Presentations were made on national and international IEA Computers in Education Study activities at the American Educational Research Association meetings.

National Research Coordinators and International Steering Committee met in Washington, D.C. (September)

Study results were released simultaneously at IEA Headquarters in The Hague with the report Schools, Teachers, Students and Computers: A Cross-National Perspective, and in Washington, D.C., with the U.S. report, Computers in American Schools, 1992: An Overview. A press release was issued in Washington, D.C. (December)

1994 A presentation was made at the American Educational Research Association meeting. (April)

Public data files for the United States with codebooks were completed. (July)

U.S. project staff are cooperating with the international coordinating center to analyze data and write materials for several international reports:

- o the performance assessment report
- o an edited collection of papers on national context of computer education (Cross National Policies on Computers in Education)
- o a short report on the student assessment (Functional Computer Literacy: The First International Assessment)
- o the final collection of technical articles called the "volume."

A video program using results from the international study, to be broadcast in the United States and other countries, in English and German language versions is proposed.

An assessment of progress toward computer-related standards in mathematics and science education is proposed. (United States)

***Publications***

International:

Schools, Teachers, Students, and Computers: A Cross-National Perspective. International Association for the Evaluation of Educational Achievement, University of Twenty, Enschede, The Netherlands. (1993)

The Use of Computers in Education Worldwide: Results from the IEA Computers in Education Survey in 19 Education Systems. Oxford: Pergamon Press. (1991)

Additional forthcoming international publications: the performance assessment report, an edited collection of papers on national context of computer education (Cross National Policies on Computers in Education), a short report on the student assessment (Functional Computer Literacy: The First International Assessment), and the final collection of technical articles. (1994)

National:

Computers in American Schools, 1992: An Overview. IEA Computers in Education Study, University of Minnesota, Minneapolis, Minnesota. (1993)

***Funding***

Stage I: Funding for U.S. participation in Stage I was provided by the National Science Foundation.

Stage II: Funding for U.S. participation in Stage II was provided by the National Science Foundation after September 1992. (Prior to that time the work on Stage II was provided on a volunteer basis and supported with a small grant from NSF for a meeting to review the potential and problems of performance testing.) A request has been made (1994) to the National Science Foundation for a small funding supplement for purposes of assessing progress toward computer-related standards in mathematics and science education.

***Information Sources***

Dr. Hans Pelgrum, International Coordinator
University of Twente Department of Education
Centre for Applied Educational Research
P.O. Box 217
7500 AE Enschede THE NETHERLANDS
telephone: 31-53-893-593
facsimile: 31-53-315-099
e-mail: topelgrm@utwente.nl

International Association for the Evaluation
of Educational Achievement (IEA) Secretariat
c/o SVO
Sweelinckplein 14
2517 GK The Hague THE NETHERLANDS
telephone: 31-70-346-96-79
facsimile: 31-70-360-99-51
e-mail: iea@svo.nl

Stage I:
Dr. Henry Jay Becker, National Project Director
Johns Hopkins University
Center for Social Organization of Schools
3505 North Charles Street
Baltimore, Maryland 21218
telephone: 301/ 338-7570

Stage II:
Dr. Ronald E. Anderson, National Project Director
Department of Sociology
909 Social Sciences Bldg., University of Minnesota
267 - 19th Ave., South
Minneapolis, Minnesota 55455-0412
telephone: 612/ 624-9333
facsimile: 612/ 624-4586
e-mail: rea@vx.cis.umn.edu

Gordon M. Ambach, Liaison to IEA
Council of Chief State School Officers
One Massachusetts Ave., N.W., Suite 700
Washington, D.C. 20001-1431
telephone: 202/ 408-5505
facsimile: 202/ 408-8076
e-mail: gambach@nas.edu

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NOTE: This study summary was reviewed and edited by Ronald Anderson at the University of Minnesota on July 8, 1994.

## *CROSS-NATIONAL STUDIES OF ADULT UNDERSTANDING OF SCIENCE*

***International Organization*** Chicago Academy of Sciences

***Years of Data Collection***

**NSF-NIH national survey of U.S. public understanding of science:** 1992 and 1994
**Co-ordinated cross-national data sets at International Center:** ongoing
**Data set archives cooperative arrangements:** ongoing

***Purpose*** The Chicago Academy of Sciences International Center for the Advancement of Scientific Literacy has been selected by the National Science Foundation and the National Institutes of Health to design and conduct **national surveys of the United States in 1992 and 1994 concerning the public understanding of science**. The International Center developed one questionnaire to continue trend measures and a second questionnaire to measure the public understanding of biomedical and behavioral science concepts. In both of these studies, attention is being focused on both the preservation of trend measures within the United States and the establishment and continuation of comparative international indicators of the public understanding of science.

The International Center provides a point of coordination for and dissemination of cross-national study data, as well as an active research program and a comprehensive archive of data sets relevant to student and adult learning about science, mathematics, and technology. Center director Jon Miller believes that the interface between the two population segment data sets is extremely important, that the education of young people begins to play out in adult behaviors and adult choices.

Over the last several decades, the influence of science and technology on the lives of citizens and consumers has become apparent. The number of public policy issues involving some aspect of science or technology has been increasing sharply over recent decades, and there is every reason to believe that it will continue to increase at an accelerating rate in the 21st century. In the next century citizens will need to be significantly better informed about scientific and technological concepts in order to fulfill roles in government, the marketplace, communication, and transportation. Governments in most industrialized nations are making concerted efforts to address the issue of pervasive scientific illiteracy.

One of the difficulties that all of the governments and organizations who are working in this field face is the absence of a point of focus and coordination for these efforts, especially a point of coordination that brings together the ideas and experiences of researchers and educators from countries around the world. While there are important differences in the educational systems of various countries, there are also commonalities. There are more areas in which researchers and educators can cooperate and learn from each other than there are areas of unique differences that would make cross-national comparisons inapplicable.

In response to a consensus among scholars and educators who have been working in this field, the International Center for the Advancement of Scientific Literacy was established at the Chicago Academy of Sciences in 1991. To provide a continuing linkage with working scholars and policy makers who utilize studies of scientific literacy, the International Center has formed an International Program Council. Through an annual meeting of the International Program Council and periodic consultations throughout the year, the Council provides continuing program guidance and assures both the international character of the programs of the Center and the utility and quality of its programs and products.

The primary program focus of the International Center is the **conduct and coordination of cross-national research regarding the development and maintenance of scientific literacy**. To date, the most extensive work in this area has been done in the United States. There is emerging a strong interest on this topic in Europe, Japan, and other countries.

In regard to school-aged populations, the International Center will serve as the design and analysis center for the Longitudinal Study of American Youth. This national study of the development of attitudes toward and competence in science and mathematics among middle school and high school student populations is being conducted primarily in the International Center to utilize more fully comparable national and international data sets and staff familiar with other educational systems.

Parallel to the conduct of new research, a second major research focus of the International Center is the development of **a research archive of data being collected about the public understanding of and attitudes toward science and technology in countries throughout the world**. About 60 percent of the known national studies of scientific literacy among adults, but significantly fewer of the studies concerning the development of an interest in and knowledge of science and mathematics during the pre-adult years have been collected. The International Center has begun to make these materials available for use by interested scholars and analysts.

In addition to providing data access, the International Center seeks to become a place that scholars and students can visit in order to learn more about these materials and to conduct research on them. To provide a forum for the exchange of research and the sharing of ideas, the International Center sponsors an annual research conference. The first meeting was held in 1992 in Tokyo and was jointly sponsored by the Japan Science Foundation, the National Institute of Science and Technology Policy (Japan), and the National Institute of Educational Research (Japan).

In 1993, the International Center hosted an International Conference on the Public Understanding of Science and Technology. The conference attracted more than 155 participants from 22 countries. Prior to the 1993 International Conference, the International Center conducted a two-day workshop on structural equation modeling.

A second major program focus of the International Center is the **development of scientific literacy during the common school years**. While there are several other centers that focus on important parts of science and mathematics education, most of the existing centers are more interested in the education of future scientists, mathematicians, and engineers than they are in the development of scientific literacy among citizens who will not work professionally in science or technology. The International Center focuses on the design and implementation of curricula and programs to serve the needs of young people who will be citizens of an increasingly scientific and technological world but who will not be professional scientists.

A third major program focus of the International Center is the **communication and dissemination of scientific information to broader adult audiences**, often referred to as information science education. Over the course of the last two decades, there has been a substantial growth in the communication of scientific information to adult populations in the United States and other industrial countries through the expansion of science and technology museum programs, natural history museum programs, zoos and aquaria, and through the growth of science television and science magazines.

There is a good deal to be learned from the experiences of each nation in this regard, and many science communicators are particularly eager to share their own experiences and learn about the work that is occurring in other nations. While each informal education channel has its own professional

organizations, many scholars in the field and practicing professionals have indicated that it would be useful to have a periodic international meeting to bring together the different parts of the informal science education chain, thus achieving greater cooperation and greater impact. The International Center will establish an exploratory planning committee in this area and examine the needs and potential benefits of an international meeting in this area. The International Center will continue to collect relevant data for its archive and relevant publications for its library.

***Organization and Management***

**Co-ordinated cross-national data sets:** To coordinate the design of questionnaires and the definition of terms and constructs in the emerging set of cross-national studies and to foster an annual discussion among the principal data collectors, the International Council for the Comparative Study of the Public Understanding of Science and Technology was formed and has held its meetings in London (1990), Tokyo (1992), and Chicago (1993). The Council is comprised of two representatives from each active data collecting country. The Council has been a useful forum for discussing problems or getting to know the other people active in this field. The 1993 meeting in Chicago focused on two substantive problems. The Chicago Academy of Sciences director, Jon Miller, was active in forming the Council and continues to participate in it.

Recognizing the inherent limitations of the Council structure, an International Center for the Advancement of Scientific Literacy was created at the Chicago Academy of Sciences. The International Center provides a point of coordination and dissemination that has a central staff, an active research program, and a comprehensive archive of data sets relevant to student and adult learning about science, mathematics, and technology.

To create an environment for a more substantive discussion of the measurement of the public understanding of science and technology, the Chicago Academy of Sciences and the London Science Museum have agreed to sponsor an annual international research conference. The first conference was held in Tokyo (1992); the second in Chicago (1993). The 1994 conference will be held in London, and the 1995 conference in Beijing (in cooperation with the China Association for Science and Technology). Miller believes that a conference setting with formal papers and opportunities for dialogue will improve the quality of coordination. The meetings of the International Council have now been linked to these research conferences.

**Data set archives cooperative arrangements:** To provide for improved data sharing, the International Center has created an archive of data sets. The archive is available to interested scholars for short-term visits, longer-term visiting scholar appointments, and for the distribution of data sets by tape or wire. The archive presently holds approximately 150 data sets and has identified an additional 100 data sets for acquisition over the next two years. The International Center is a member of the ICPSR and has established cooperative arrangements with the ESRC Archive (U.K.), the Steinmetz Archive (Netherlands), the Central German Archive (Koln), the Danish Archive (Odense), and the Swedish Archive (Gothenberg). The International Center is presently seeking corporate and government support for the expansion of the International Center archive and the support of visiting scholars.

## *Design*

### *Participants*

**NSF-NIH national survey of U.S. public understanding of science:** 1992 and 1994: International Center conducted the study with the U.S. public.

**Co-ordinated cross-national study data sets in International Center:**
Britain, Bulgaria, Canada, China, European Community, Japan, Spain, New Zealand, United States

**Data set archives cooperative arrangements:**
ESRC (United Kingdom), Steinmetz (Netherlands), Central German Archive, Danish, Swedish

### *Procedures and Summary of Content*

**Co-ordinated cross-national study data sets in International Center:** The coordinated cross-national study of the public understanding of science and technology at the national level is a relatively recent phenomenon, beginning with a joint study between the United States and Britain in 1988. The origin of this work comes from the National Science Board. Beginning in 1972 and continuing biennially the NSB has published Science and Engineering Indicators that includes a chapter on the public understanding of science and technology. The data for the 1972, 1974, and 1976 reports were collected by adding 20 questions to an omnibus survey conducted by the Opinion Research Corporation; since 1979 the National Science Foundation has sponsored a national probability sample study devoted to measuring the public understanding of science and technology. For the 1979 study in-person interviews were conducted by the Institute for Survey Research at Temple University.

Within the past several years the United Kingdom, the European Community, Canada, Japan, New Zealand, China, Spain, and Bulgaria have conducted similar surveys; Korea, Belgium, and Germany are also planning surveys. While the United States has a 20-year time series, only the European Community has successfully completed a second cycle of data collection to date. There are two continuing efforts to coordinate the design and collection of these cross-national studies and to disseminate the resulting data sets.

### *Data Collection and Analyses*

**Co-ordinated cross-national study data sets in International Center:** The International Center has a small but growing set of studies and data sets, and an expanding network of data collectors and analysts in an increasing number of countries. It has taken some initial steps to improve coordination and dissemination. The current inventory of cross-national studies and data sets is as follows:

National Studies of the Public Understanding of Science and Technology

| Year | Country | Principal Investigator | N | RA | DA |
|---|---|---|---|---|---|
| 1957 | US | Davis, Robert | 1,999 | Y | Y |
| 1972 | US | NSB | 1,500 | Y | Y |
| 1974 | US | NSB | 1,500 | Y | Y |
| 1976 | US | NSB | 1,500 | Y | Y |
| 1979 | US | Prewitt, K. and Miller, J. | 1,500 | Y | Y |
| 1981 | US | Miller, J. | 3,200 | Y | Y |
| 1983 | US | Miller, J. | 2,000 | Y | Y |
| 1985 | US | Miller, J. | 2,000 | Y | Y |
| 1088 | US | Miller, J. | 2,000 | Y | Y |
| 1988 | Britain | Thomas, G. and Durant, J. | 2,000 | N | Y |
| 1989 | EC | Gabolde, J. | 12,000 | N | Y |
| 1989 | Canada | Einsiedel | 2,000 | Y | Y |
| 1990 | US | Miller, J. | 2,000 | Y | Y |
| 1990 | New Zealand | Billingham, G. | 2,000 | Y | N |
| 1991 | Japan | Nagahama, H. | 1,500 | Y | Y |
| 1992 | China | Liu, W. | 5,000 | Y | * |
| 1992 | EC | Gabolde, J. | 13,000 | N | * |
| 1992 | Spain | Pardo, S. | ? | N | N |
| 1992 | Bulgaria | Unknown | ? | N | N |
| 1992 | US | Miller, J. | 2,000 | I | I |
| 1992 | US | Miller, J. | 3,200 | I | I |

Legend:
N = Number of cases
RA = Report available
DA = Data available
I = In process
* = Expect to receive summer 1993

NSB = National Science Board

***Timetable***

1994: **NSF-NIH national survey of U.S. public understanding of science:** Data was colleted.

1994: The International Center for the Advancement of Scientific Literacy-London Science Museum convened an international research conference in London.
The International Center for the Advancement of Scientific Literacy-International Council for the Comparative Study of the Public Understanding of Science and Technology met.

1995: The International Center for the Advancement of Scientific Literacy-London Science Museum convened an international research conference in Beijing.

***Funding***

**National survey of U.S. public understanding of science:** The National Science Foundation and National Institutes of Health provide funding.

***Information Sources***

Jon D. Miller, Vice President
The Chicago Academy of Sciences
2001 North Clark Street
Chicago, Illinois 60614
telephone: 312/549-0606
facsimile: 312/549-5199

The Chicago Academy of Sciences
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NOTE: This study summary was reviewed and edited by Veronica Muñoz for Jon Miller at the Chicago Academy of Sciences on July 8, 1994.

## *EDUCATION INDICATORS PROJECT (INES)*

***International Organization*** Organisation for Economic Co-operation and Development

***Years of Data Collection***

| | |
|---|---|
| Phase 1: | 1988-1989 |
| Phase 2: | 1990-1991 |
| Phase 3: | 1992-1996 |

***Purpose*** Increased need for information on education led the members of the Organisation for Economic Co-operation and Development to initiate the International Education Indicators Project in an effort to create a set of comparative international education indicators that represent the key features of education systems. The project was launched via two conferences, hosted by the government of the United States (1987) and the government of France (1988). The project went from the planning phase to the production phase following a conference on the project hosted by the government of Switzerland in 1991.

The International Educational Indicators Project is an effort of the Organisation for Economic Co-operation and Development-Centre for Educational Research and Innovation to develop a system of indicators for cross-national comparisons in education for the use of policy makers, consumers, and "third parties" like private industry. To achieve this purpose, INES is:

- developing, collecting, analyzing, and offering a preliminary interpretation of a set of key indicators for international comparisons
- providing a forum for international cooperation and the exchange of information about methods and practices of developing and using educational indicators for national policymaking and managing education systems
- contributing to evaluation methodology and practice to develop more valid, reliable, and comprehensive indicators, and to gain a better understanding of their use in policymaking.

The task of INES Project Network A - Educational Outcomes is to:

- Develop indicators of student performance outcomes.
- Develop a comprehensive analytic frame for educational achievement outcomes.
- Develop specific criteria and standards for constructing and evaluating indicators of educational achievement.
- Apply the frame, criteria, and standards to existing international surveys.
- Suggest how these principles can be used by OECD to obtain achievement data on a regular basis.

***Organization and Management*** The INES Project is managed by the Centre for Educational Research and Innovation within the Organisation for Economic Co-operation and Development. The work of the project is being carried out by a consortia of countries comprising a Technical Group and four Networks:

- Network A: Educational Outcomes
  (chaired by the United States)

- Network B: Education and Labor Market Destinations (chaired by Sweden)
- Network C: Features of Schools (chaired by the Netherlands)
- Network D: Attitudes and Expectations (chaired by the United Kingdom)

Using a network structure as a basic organizing framework, the first Phase of the INES Project explored the feasibility of developing and reporting comparable indicators concerning the education systems of participating countries. The network structure had five domains: student flows, student outcomes, functioning of schools, costs and resources, and attitudes and expectations. Each network had a lead country that coordinated the contributions of members, supported the theoretical and technical work required, and produced the network report.

At the end of the first phase in 1989, Network 2, Student Outcomes, was split into two groups: Network A, Student Achievement Outcomes and Network B, Education and Labor Market Destinations. The United States was the lead country for Network 2, and continues in that role for Network A. Network A (now called Educational Outcomes) is responsible for the development and preparation of educational outcome indicators.

Phase 3 project organization continues along the same lines as the previous two phases, with the exception that the two former technical groups have been combined, and the leadership of the network on School Processes has been passed from France to the Netherlands. Scotland has assumed responsibility for the network investigating indicators of attitudes and expectations. Network A continues to be chaired by Gary Phillips of the National Center for Education Statistics in the United States.

***Design*** Following an exchange of preliminary information on definition of fields, concepts, methods of work, and data availability, networks started working in January 1987 to establish a working plan for the definition of a limited set of indicators. These plans were then further refined and endorsed by a scientific advisory group, which in Phase 2 was reconfigured into a consultative group. In Phase 3 the consultative group was replaced by a policy review advisory group, chaired by the chairman of the CERI Governing Board. In Phase 2, networks and technical groups conducted further work with the aim of selecting some trial indicators, establishing data sources, and undertaking some experimental indicator calculations. The results, analyses, and requirements for further work are published in Education at a Glance.

***Participants***

Eighteen countries participated in Phase 1 of the INES Project Network A - Educational Outcomes: Australia, Belgium, Canada, Denmark, France, Germany, Italy, Japan, Luxembourg, The Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, the United Kingdom, and the United States.

Seventeen countries participated in Phase 2 of the INES Project Network A - Educational Outcomes: Belgium, Canada, Denmark, Finland, France, Germany, Italy, Japan, Luxembourg, The Netherlands, New Zealand, Norway, Spain, Sweden, Switzerland, the United Kingdom, and the United States.

Countries registered for Phase 3 (1992-96) are:

| | Network A | Network B | Network C | Network D | Technical Group |
|---|---|---|---|---|---|
| Australia | ? | ? | ? | ? | ? |
| Austria | X | X | X | – | X |
| Belgium | X | X | X | X | X |
| Canada | X | X | – | X | – |
| Denmark | X | X | X | X | X |
| Finland | X | X | X | X | X |
| France | X | X | X | X | X |
| Germany | X | X | – | – | X |
| Greece | – | – | – | – | – |
| Iceland | – | – | – | – | – |
| Ireland | X | X | X | – | X |
| Italy | X | X | X | X | X |
| Japan | – | – | – | – | X |
| Luxembourg | ? | ? | ? | ? | ? |
| Netherlands | X | X | X | X | X |
| New Zealand | X | X | – | – | X |
| Norway | X | – | X | – | X |
| Portugal | X | X | X | X | X |
| Spain | X | X | X | X | X |
| Sweden | X | X | X | X | X |
| Switzerland | X | X | X | X | X |
| Turkey | X | X | X | X | – |
| United Kingdom | X | X | X | X | X |
| United States | X | X | X | X | X |
| Total | 19 | 18 | 16 | 13 | 19 |

***Procedures and Summary of Content*** In Phase 1 the INES Project Network A developed a conceptual framework in which education outcomes were seen as a function of resources, environment (including demographic, economic, and social aspects), and structural processes. Work was organized around three areas: completion of secondary education, cognitive achievement and other assessment outcomes, and activity following completion of secondary education. A list of indicators in each area was generated, discussed, and refined.

Phase 2 INES Project Network A aims were to develop a comprehensive analytical frame for educational achievement outcomes; develop specific criteria and standards for constructing and evaluating indicators of educational achievement within the general template established for the INES Project; and apply the template, criteria, and standards to existing international surveys to test the extent to which existing data and procedures meet these criteria and standards.

The INES Project entered into its third and final phase at the beginning of 1993. This phase, scheduled to continue for five years, aims at establishing an organizational framework allowing for the regular production of a set of international education indicators. It includes continuation of ongoing conceptual work and regular publication of the calculated indicator set as Education at a

Glance. At the end of this phase it is anticipated that the indicators function will become part of the regular responsibilities of the Education Division of OECD.

During Phase 3 the second edition of Education at a Glance has been published (1993), and a completely revised edition will be published in 1994. A state-of-the-art report on the results achieved in implementing an effective international information system on education statistics will be an additional product. By the time the INES Project is completed in 1996, the Organisation for Economic Co-operation and Development and its Member countries should have succeeded in setting up an international database containing up-to-date and relevant education statistics and indicators; a fully computerized on-line network for collecting and disseminating the data; and cost-effective procedures for processing the data.

***Data Collection and Analyses*** In Phase 2 INES Project Network A surveyed member countries in an attempt to identify existing data from national assessments or examinations that might serve as outcome indicators. The survey produced much valuable information about the variety of assessment structures and practices, and allowed some conclusions to be drawn about commonalities. It also demonstrated that it would be extremely difficult, if not impossible, to depend on data produced from these examinations or assessments to produce comparable indicators, as they vary widely in purpose, ages tested, subjects tested, and forms of testing.

Network A proposed a set of indicators (multiple comparison of mean achievement scores, international comparative distribution of achievement scores, learning/teaching ratio, and between school and between classroom variation in achievement scores) that can provide information about the productivity of the system relative to other countries, the effectiveness with which the curriculum has been learned, and how equitably achievement is distributed within a country. These indicators were calculated on a trial basis using data from the IEA Second International Mathematics Study and the mathematics portion of the Second International Assessment of Educational Progress. The results were published in the first edition of Education at a Glance.

In Phase 3 each of the INES Project networks and the technical group are involved in data assembly and preparation of indicators for the third edition of Education at a Glance. The technical group is piloting the use of a new data collection form for finance data. This form is also being used as the basis for a revised OECD/UNESCO/EUROSTAT pilot of the joint survey. This form is an outgrowth of the Expenditure Comparability Study conducted for the National Center for Education Statistics.

Current long-term activities of the INES Project include writing and editing chapters for several technical volumes that the project will publish in 1995, piloting data collections to measure cross-curricula competencies, and examining the use of national assessments for international comparisons. Each network is preparing books on their work to date and its implications for future international comparison work. These books are intended to compile and make more publicly available the methodological contributions achieved in Phase 3 of the INES Project.

The second edition of Education at a Glance was published in December 1993. It contains 38 indicators organized by 1) cost, resources, and school processes; 2) contexts of education; and 3) results of education. National Center for Education Statistics representatives to the project's networks and technical group were responsible for providing information about the United States and preparing the student outcome indicators. NCES is involved in developing ideas for indicators and data collection strategies for the indicators to be published in the third edition of Education at a Glance. These ideas include a survey on attitudes toward education, a description of the incorporation of

national goals into educational systems, and the measurement of the educational attainment of workers in different occupations and industries.

The INES Project attitudes survey is a public opinion survey that includes questions on subjects that young people study in secondary school, qualities that young people may have developed by the end of their compulsory schooling, the importance of areas for schools to emphasize in order to achieve their goals (e.g., career advice), how much responsibility the school should have (compared with the home) for the personal and social development of young people, the importance of certain decisions being made at the school level, and the respect for and earnings of secondary school teachers. About ten OECD countries will be participating in the survey.

For the second edition of Education at a Glance, Network A prepared indicators for reading literacy, mathematics, and science for 13/14-year-olds. Three types of indicators were prepared: comparison of means (multiple-comparison chart); distribution of scores; and between and within school variance. In addition, Network A prepared a brief cross-subject-based introduction to its section. As with indicators presented in the first edition of Education at a Glance, all indicators used the standards that Network A has adopted for its work.

Network A remains committed to calculating the indicators already developed, and the second edition of Education at a Glance presented an expanded set using science data from the International Assessment of Educational Progress study and indicators of reading literacy from the International Association of Educational Achievement Reading Literacy Study at two different age populations. Network A has also explored some new indicators of cognitive achievement, including attempts to measure the "value added" to student learning by schooling, and a measure of change over time.

At a very early stage within Network A it was quite clear that the Network needed a set of technical standards by which to judge the adequacy of education outcome indicators. It was felt that such a set of standards were needed because most outcomes data available to the Network were based on surveys that have estimable sampling error and outcome data usually involve the administration of tests, which also involve estimable measurement of error.

Because of these two sources of error it was felt that users of the international outcomes indicators should have some sense of the technical quality of the indicators. Network A has drafted standards for international indicator data, for the purpose of directing a reader to the fact that a standard is not being met and therefore to results that ought to be interpreted with caution. Network A recommends that future international assessment studies be conducted with these standards in mind, and that other indicator projects consider technical standards as part of their reporting practices.

In addition, Network A has significantly expanded its scope to explore ways in which indicators of non curriculum bound outcomes might be developed. In the first instance, this developmental work concentrated on identifying suitable instrumentation and data sources for measuring socio-cultural knowledge and skills, such as basic knowledge required for orientation in the political, social and economic world; problem solving capacity in everyday and critical situations; self perception in the social context; and perception of critical human values. A small subgroup is developing a more detailed plan to identify questions and issues and design a questionnaire on national practices in a small number of countries.

A second area of new work concerns outcomes that derive from the goals for education systems rather than for individuals. This work derives from the perspective that what is an output from one part of the system can be an input for another and vice versa. One of the important outcomes of education systems is what opportunities are provided or offered to students. A second subgroup is

investigating ways in which these system outputs can be systematically defined and measured. The end product of this work may take the form of qualitative rather than quantitative indicators, and thus an important part of this work will be to investigate new ways of presenting data.

Network A has undertaken several research and development activities that will result in indicators for future editions of Education at a Glance that go beyond the current subjects. These activities include:

- A study of national assessment systems, with a view to determining a) what countries assess and how and b) the extent to which these national assessments could provide comparable information on outcomes, or, if found not to be suitable in their present form, how they might be adapted to meet this purpose (with particular attention being given to issues of anchoring and developing an item bank). The project will describe both traditional examination systems serving certification or selection purposes and assessment programs designed to monitor, evaluate, or hold accountable systems or individuals, with an emphasis on the latter. This work is being carried out by Thomas Kellaghan in Ireland.

- The development of indicators for cross-curriculum competencies. The network plans to develop indicators for civic competencies and, finally additional cross-cutting student outcomes. This work is being carried out by the CCC subgroup headed by Uri Trier in Switzerland.

- The development of information about national goals, stated and realized curriculum, and student performance. The initial efforts will include completion of a survey of national goals and a review of stated curriculum. This work is being carried by the GOALS subgroup headed by Marit Granheim in Norway and Sten Petterson in Sweden.

- The preparation of new analyses built around subject-bound data. In particular, Network A is considering gender-based indicators, percent competent and age 9-14 progression in reading literacy, mathematics, and sciences for the third edition of Education at a Glance.

These efforts were in combination with work on subject-bound indicators and standards development for major elements of an emerging strategic plan for Network A activities.

Network A remains cognizant of the limited nature of currently existing cross-national surveys of education outcomes, and supports efforts for OECD to take a more active role in defining its data needs. Network A is also pursuing the development of indicators of non-curriculum bound outcomes. A subgroup, under the leadership of Uri Trier of Switzerland has been charged with the developmental work in this area. The group is considering developing indicators in five areas: knowledge of the social and political world, problem-solving, communication, self perception, and knowledge of democracy. The subgroup has undertaken a preliminary survey to establish the importance of non-curriculum bound outcomes areas in national goals. It has also undertaken a small-scale research project to identify these areas in the curriculum in four countries and commissioned expert papers in each of the five areas of interest.

The second set of education indicators (appearing in the second edition of Education at a Glance, 1993) have come at a time when OECD Member countries face serious problems of sluggish growth and rising unemployment. Because of this situation, in 1992 the OECD Council of Ministers requested that the Secretariat undertake a major study of the causes for, and possible remedies to,

current high levels of unemployment. The study's preliminary findings, presented in Employment/Unemployment Study: Interim Report by the Secretary-General (1993), include human resource development in the range of strategies called for to boost employment and reduce unemployment. The report notes in particular the need for sound initial education, better integration between academic and vocational studies, appropriate linkages and partnerships between schools and employers, workforce relevance of tertiary education, and an adult training system adapted to the needs of employers, workers, and non-workers. The report further recognizes that the relationships between education, training, employment, and productivity growth are complex. The formulation of education policy depends on broad social, economic, and cultural factors.

The monitoring of progress and experimentation in systems of education depends heavily on indicators that enable government authorities and other groups to judge the context and functioning of education and the results achieved. Education indicators can reveal some of the most critical weaknesses of education systems, and can aid the design of corrective policy. Problem areas that need to be addressed are the unequal distribution of opportunities, rigidity of student streaming and tracking systems, and poor use of human resources caused by ineffective education and training programs. The high costs of education are accompanied by discrepancies in per student expenditures. Data presented in Education at a Glance (1993) can contribute to identifying some critical problems and establishing new priorities.

The 1993 edition of Education at a Glance includes economic, social, and demographic context of education; results of education; and information on costs, resources, and processes. Thirty eight indicators offer a body of information on crucial aspects in education policy -- investment levels, financing and staffing, decision-making, level of participation, student tracking, student achievement in key subjects and graduation rates, and whether some levels and types of education give better protection than others against the risks of unemployment.

For each topic, the indicators presented in this publication reveal many similarities and dissimilarities across the countries, and raise questions concerning goals and efficiency of countries' varied educational policies. The indicators also provide important information about new developments in OECD countries' education systems. The primary result of the set of indicators in this edition of Education at a Glance affirms that education and training are part of the problem of a high level of unemployment as well as part of the solution.

Education at a Glance is not a historical study but an instrument for monitoring and guiding educational policy. For this reason the data have to be processed quickly and published without undue delay. Education at a Glance should also reflect reality, which means that the changing conditions of education in a complex international environment must be taken into account. For this reason all the OECD Member countries have engaged in the demanding exercise of updating information, which has involved substantial improvements in the data collection, processing, analysis, and reporting procedures. The year 1993 was devoted to the task of improving the procedures for data collection and transfer. The experience the INES participants have gained in producing the second edition of Education at a Glance is an important resource for achieving a formal and standardized protocol for the regular production of international education indicators. This is one of the major long-term objectives of the INES Project.

The development of the OECD set of international education indicators and the publication of Education at a Glance are generating a series of studies at the national level which complement the international perspective. National indicators studies have been produced or are being developed in Canada, Belgium, Denmark, France, and the United States. This is a very important development

because the policy-relevance and the adequacy of any interpretation of the OECD indicators depends on whether the international data are supplemented by country-specific, within-system information.

The OECD secretariat has received the following reports: The State of the School: 30 indicators of the educational system (Ministry of National Education and Culture, France); Geography of the School (Ministry of National Education and Culture, France); Facts and Figures, Education Indicators Denmark (Ministry of Education and Research, Denmark); The National Education Goals Report, 1992: Building a Nation of Learners (National Education Goals Panel, U.S.A.); How in the World Do Students Read? Effective Schools in Reading: Implications for Educational Planning; and Teaching Reading Around the World (International Association for the Evaluation of Educational Achievement, The Netherlands).

The Policy Review and Advisory Group were joined in their January 1993 meeting by three invited consultants: Erik Hanushek (United States), Claus Moser (United Kingdom), and Francois Orivel (France). These consultants concluded that the first edition of Education at a Glance marks a major step in the development of international education statistics and indicators. They believe that the INES study serves an important function in driving improvement in data collection at the national level. They also identified the need for more adequately addressing the constituencies of industry, business, and the general public; more fully developing indicators concerning outcomes of education; and gathering more information about the contexts -- demographic, cultural and ecological -- in which education systems operate. In addition, they concluded that much value added would be achieved if time series and forecasts were included in a future edition, and that an indicator report must strike a fine balance between complexity and simplicity. They noted that some indicators may be too close to elementary statistics, whereas many others are too complex in the form in which they are shown.

It may become necessary to publish two versions in the future: an indicator report addressed to specialists, and another, much shorter and simpler report intended for the general public. They also stated that clarification is needed on how indicators can be fruitfully employed not merely for informing debate but also for decision-making.

The future of the indicators project depends on the capacity of the OECD to deal with the issue of data collection. In developing new indicators for the third edition of Education at a Glance, the Networks and the Technical Group required data not currently available on a regular basis. Another problem is that some of the data are being provided by different sources. The Policy Review and Advisory Group agreed that it was urgent to address the information needs of the OECD education statistics and indicators activity, and decided to explore ways for the OECD to play an active role in the gathering of education data.

A January 21, 1993 letter from T.J. Alexander, director of the OECD Directorate for Education, Employment, Labour and Social Affairs, to the Education Committee of the CERI Governing Board informed the Members of the outcome of consultations with international organizations to improve the collection, analysis, and publication of CERI indicators and education statistics. OECD, UNESCO, and EUROSTAT have agreed on the need to adapt the ISCED classification system and to revise the common questionnaires in the light of new data requirements that have arisen. With the support of OECD and EUROSTAT, UNESCO will carry principal responsibility for the adaptation of the ISCED system to current needs. In consultation with EUROSTAT and UNESCO, OECD will take the lead in updating and revising the common questionnaires. OECD and EUROSTAT will jointly develop the communication technology needed for the electronic transmission of data from the capitals to the international organizations.

OECD will give priority to the improvement of the indicator templates, and OECD and EUROSTAT have agreed to publish jointly the INES Technical Handbook in late 1994 or early 1995. This will guarantee that the definitions, calculation procedures, and technical criteria used by the organizations are fully compatible. EUROSTAT will carry out a feasibility study concerning the production of education indicators that are particularly suited to the needs of the European Community.

***Timetable***

1987 The International Conference on Educational Indicators was convened in Washington, D.C. (November)

1988 The Second International Conference on Educational Indicators was convened in Poitiers, France. (March)
Networks were established.
Reports of Network 2 countries were transmitted to the United States.
Scientific Advisory Group met.
A preliminary draft plan for indicators was prepared.

1989 A Network seminar was convened to establish a working plan.
The Scientific Advisory Group met to review and coordinate network plans.
A Network analytical draft paper was completed.
A General Assembly of five networks met in Semmering, Austria.
A Network analytical paper was delivered to CERI.
The Phase 2 workplan endorsed by the CERI Governing Board was approved. (November)

1990 A Network A Planning Meeting was convened in Washington, D.C. (March)
The Consultative Group met in Washington, D.C. (May)
Network A met in Washington, D.C. (June)
The revised Network A survey was sent to network members. (July)
The survey was returned with members' comments. (August)
The survey was finalized and distributed. (August)
The Consultative Group met with network leaders in Paris, France. (September)
The survey was carried out and completed. (October)
The finalized criteria paper was sent to members. (October)
The Consultative Group met in Australia. (November)
A list of proposed indicators was sent to members. (November)

1991 Network A met in Washington, D.C. (January)
Network leaders met in Paris. (February)
The Consultative Group met in Washington, D.C. (April)
The Consultative Group met in Paris. (June)
Network A met in Breckinridge, Colorado. (June)
The Network A final report was completed. (August)
The INES Project General Assembly met in Lugano, Switzerland. (September)

1992 Education at a Glance was published (first edition).
Networks A and D met in Paris. (March)
The Technical Group met in Paris. (June)
Network A met in Oslo. (June)
The Policy Review and Advisory Group met. (September)

Network D met in Edinburg. (September)
Network C met in The Hague. (November)

1993 Education at a Glance was published (second edition).
Making Education Count was published.
Network A met in Vilamoura, Portugal. (February)
INES staff met officials from EUROSTAT. (February and March)
The Technical Group subgroup on education indicators met. (March)
Six members of the Network A subgroup on GOALS met in Oslo, Norway. (March)
Members of Network A CCC group met in Geneva, Switzerland. (March)
Network B met in Paris, France. (March)
National Co-ordinators met in Paris, France. (March)
Network D met in Madrid, Spain. (March-April)
The Technical Group and Networks A and C met in Paris. (June)
The Policy Review and Advisory Group met. (July)
The Technical Group met. (October)

1994 Education at a Glance will be published (third edition).
INES Technical Handbook will be published jointly by OECD and EUROSTAT. (late 1994 or early 1995)

1995 Several compilations of methodological contributions achieved in INES Project Phase 3 will be published.

1996 An international database, an on-line network for collecting and disseminating data, and a cost-effective procedure for processing data will be established.
Indicators function will become part of the regular responsibility of the OECD Education Division.

***Publications***

Education at a Glance (first edition), 1992 (30 indicators). Education at a Glance (second edition), 1993. The INES Project will result in successive editions of Education at a Glance (containing results of indicator calculations); a handbook of international educational indicators (containing background information on the development of the project and templates for each indicator); and a set of theoretical and technical papers on various indicator topics.

Making Education Count: Developing and Using International Indicators (summer 1993). A reader bringing together 18 chapters on the development and interpretation of the international education indicators.

INES Technical Handbook (to be published jointly by OECD and EUROSTAT late 1994 or early 1995).

Several compilations of methodological contributions achieved in INES Project Phase 3 (to be published in 1995).

***Database***

By the time the INES Project is completed in 1996, the Organisation for Economic Co-operation and Development and its Member countries should have succeeded in setting up an international database containing up-to-date and relevant education statistics and indicators; a fully computerized on-line network for collecting and disseminating the data; and cost-effective procedures for processing the data.

***Funding*** Each member country has contributed resources to this project; some have provided substantial additional assistance through their support to the Technical Group, the four Networks, and several ad hoc investigative teams. The publication of Education at a Glance has been facilitated by a special grant to INES by the National Center for Education Statistics in the U.S. Department of Education. Each member country generally carries its own cost of participating in the INES Project. The lead country for each network generally has responsibility for costs incurred in meetings, communication between members, staff support, and publications. The U.S. portion is funded by the National Center for Education Statistics.

***Information Sources***

International Coordinating Center:
Centre for Educational Research and Innovation
Organisation for Economic Co-operation and Development
2 rue Andre-Pascal
75775 Paris Cedex 16 FRANCE

International Coordinator:
Dr. Norberto Bottani, Principal Administrator INES Project
Centre for Educational Research and Innovation-OECD
2 rue Andre-Pascal
75775 Paris Cedex 16 FRANCE
telephone: 33-1-45-24-92-50
facsimile: 33-1-45-24-90-98

Chair, Consultative Group (Phase 2):
Dr. Herbert Walberg
University of Illinois
522 N. Euclid Avenue
Oak Park, Illinois 60302
telephone: 312/ 996-5580
facsimile: 312/ 996-6400

National Coordinating Center, Network A:
National Center for Education Statistics
555 New Jersey Avenue
Washington, D.C. 20208

National Coordinator:
Dr. Dawn Nelson
International Studies, Data Development Division
National Center for Education Statistics
555 New Jersey Avenue, N.W.
Washington, D.C. 20208
telephone: 202/ 219-1740
facsimile: 202/ 219-1575

Chair, Network A:
Dr. Eugene Owen, Chief, International Activities
Education Assessment Division
555 New Jersey Avenue, N.W.
Washington, D.C. 20208
telephone: 202/ 219-1746
facsimile: 202/ 219-1736
e-mail: Eugene_Owen@doed.gov

Binkley, Marilyn R.

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U.S. Department of Education

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NOTE: This study summary was prepared on June 1, 1994 and sent to Gary Phillips (former chair of Network A) and to Eugene Owen (chair of Network A) at the National Center for Education Statistics for review. No suggestions for changes have been made.

## *INTERNATIONAL ADULT LITERACY STUDY*

***International Organization*** Statistics Canada

***Years of Data Collection*** Pilot: 1993
Main data collection: 1994

***Purpose*** The International Assessment of Adult Literacy is a joint project of the Educational Testing Service and Statistics Canada. Its basic objective is to concurrently profile the literacy skills of adults in a number of countries/languages. Methodologically the study represents a fusion of educational testing and survey research. In order to build policy-relevant new data sets to feed the public discourse on emerging policy issues, the IALS is designed as a fusion of educational testing (of the type that goes on in the school system) with household surveys. The objective is to concurrently administer the same measure in a number of languages and countries to profile adult literacy skills. Although this objective is simple, achieving it is complicated.

IALS is based on the collective experience of Educational Testing Service and Statistics Canada with about 50,000 respondents. It conceptually close to the Survey of Literacy Skills Used in Daily Activities (LSUDA), which was fielded by Statistics Canada in 1989. The IALS will incorporate an international dimension to enable comparison of literacy profiles between countries. International objectives are to:

- test the notion that the decoding and decision making skills embodied in the Canadian and U.S. assessments are stable across language groups and cultures
- promote the conception of literacy underlying the direct assessments conducted in Canada and the United States
- provide comparative data on adults and workers in countries that represent a cross-section of Canada's current and emerging trading partners
- compare and contrast the literacy skill profiles for economically important sub-populations across countries and language groups.

In addition, this study has objectives specific to Canada:

- provide an updated profile of adult literacy abilities for Canada for comparison to that provided by the Survey of Literacy Skills Used in Daily Activities
- provide sufficiently large numbers of visible minorities, seniors, recent graduates, and out of school youth to profile their skill levels
- shed light on the relationship between performance, educational attainment, labor market participation and employment for those individuals found to be at Level 3.

IALS promotes a modified model of learning. The old model was based on the concept that learning is centered exclusively in a formal system; a single learning event early in life (focus on youth); once acquired, literacy skills are viewed as a static commodity, and the adult milieu has no effect on skill retention or enhancement. The new model is based on the concept that self-directed instruction

complements the formal system; repeated learning events (focus includes adults); skill attrition; and opportunity to learn plays a crucial role in skill maintenance.

IALS incorporates a modified model of reading and yields current estimates of the magnitude of the literacy "problem" across a continuum of skill levels. IALS allows analysis of the covariates of measured performance. This information is useful in understanding etiology of the phenomenon and identifying populations at risk. This study model offers information on behaviors, motivational factors, and self-assessed skill levels. These data are useful in identifying barriers to remediation and are key input for optimizing program design, delivery, and marketing. The IALS model also renders explicit the relationship between tested performance and traditional literacy proxies, such as educational attainment. This information is useful in projecting the evolution of skill profile and in generating profiles for small geographic areas.

Some higher order benefits of the IALS are: unique collaboration between policy makers, collection experts, and measurement experts that have the subject matter knowledge; promotion of NALS measurement protocol; and determining the cultural limits of the conceptual framework.

U.S. Department of Education recent interest in the current IALS design (which now contains connections with the work force) is in its relating to the importance placed on end results of the educational process and to U.S. national education goals, particularly the fifth goal on work force skills and adult literacy concerns (which in international comparison is work force competence). As Statistics Canada has assumed leadership in this project, it becomes possibly the first government-to-government international study. The U.S. Department of Education, as well as the U.S. Department of Labor and other U.S. government agencies are interested in a joint collaboration, co-funding the U.S. participation in this study. It is smaller in scale in terms of the number of countries that might be involved, more clearly targeted towards policymakers' interest, and coordinated or carried out by government agencies that have the same concerns about the quality of the studies demanded for supporting policy decision making.

The U.S. Department of Education is particularly interested in conducting a linkage study to the U.S. national adult literacy survey, to link the rich background information to an international context and look at the performance of different groups in the U.S. population relative to other countries, as well as a country-to-country comparison.

An additional higher order benefit of the IALS is getting other governments interested in government-to-government initiatives that would become another model for conducting international studies and perhaps a more efficient and effective model for doing that. In the interest of stability and viability of the organization structure for international studies, an IALS government-to-government initiative would provide a valuable opportunity to begin networking with stable government organizations -- which have people who are concerned about the quality of a study and who have data management experience as well as the existence of a survey that can serve as the vehicle for a study -- provides an interesting new approach for conducting international studies.

***Organization and Management*** An agreement in principle with National Center for Education Statistics has been established that the study should become a joint government undertaking (rather than an Educational Testing Service-Statistics Canada undertaking). Negotiation of terms is underway with NCES. Whatever the outcome of these negotiations, ETS will continue to play a central technical role in the study.

***Design***

***Participants*** Canada, France, Germany, Ireland, the Netherlands, Poland, Switzerland, and the United States (Mexico had to withdraw). Discussions are underway with Australia, Italy, Japan, New Zealand, Portugal, and the United Kingdom concerning the costs and criteria for joining IALS at this juncture.

***Sample*** The study will yield a sample of 3,000 adult Canadians. This sample will be enriched to ensure a minimum yield of 500 cases for seniors, in-school youth, out-of-school youth, official-language visible minorities, and allophone visible minorities, bringing the total sample to approximately 4,800. IALS methodology requires a representative probability sample of adults 16-65, a minimum yield of roughly 3,000 cases, and 500-600 cases required for each domain/geography to be profiled.

***Procedures and Summary of Content*** The study will include a background questionnaire, a brief set of core items, and a large main test set of simulation tasks. The core items and simulation tasks will assess three aspects of literacy: prose literacy, document literacy, and quantitative literacy. In order to ensure broad coverage of the three literacy domains and not to overburden individual assessment takers, a Balanced Incomplete Block (BIB) assessment design will be utilized. Item response theory (IRT) will be utilized to estimate performance on each of the three literacy domains. Results will be reported in terms of proficiency levels.

IALS technical challenges include development of a multilingual test with good psychometric properties; ensuring comparability of key elements of a background questionnaire (e.g., educational attainment, industry, occupation); extension of a test to more skill dimensions (e.g., problem solving, communication); interviewer administered collection in each respondent's home; and interview length of roughly 90 minutes. (In Canada each case costs $150-$200.) An interviewer administers each element serially in a respondent's home.

The IALS background questionnaire includes classification variables (household arrangements, place of birth and immigration, income, education, language, and ancestral/parental information); labor market activity (labor force history, labor force status, career strategies); workplace skills (general skills and literacy skills); training/adult education (nature of, attitudes to, outcomes of); and general literacy concerns.

***Data Collection and Analyses*** Assessment is virtually complete, having passed the final series of reviews. The background questionnaire is also in the final review stage, with participants having agreed to a set of mandatory items to be carried in all countries.

Canada, France, Germany, Ireland, and the Netherlands have all completed large scale pilot surveys that have been analyzed by ETS. Switzerland and Poland have conducted more modest tests of their instruments. In April 1994 participating countries met in Hamburg to discuss the results of the pilot surveys and to plan for implementation of the main study (main data collection in September 1994).

Decisions made at the April 1994 meeting were:

- Based on an analysis of pilot assessment data by ETS and Stan Jones, Canada's technical consultant on the study, participating countries have agreed to a final item selection and test design that will afford the psychometric equivalence needed to support international comparisons.

- Countries have committed to field a comprehensive set of standardized background variables including modules on adult education participation and income. Both of these modules had been problematic to at least some of the countries prior to piloting.

- Countries have agreed to a proposed content and structure for the international comparative report, as well as a process for vetting successive drafts of the report as they become available. Approval in principle was also reached to have the report released as a joint Statistics Canada-OECD publication.

- A compromise was reached concerning access to microdata following release of the international comparative report. The Canadian tradition would have seen non-confidential microdata being released concurrently with the comparative report. Countries have agreed in principle to a controlled release for a period of a year after which the dataset would become freely available.

***Timetable***

1993 The survey was piloted.
1994 Main data will be collected. (September)

***Publications***

International comparative report: A single international report will focus on the similarities and differences in the literacy profiles of participating countries and their implications for national and international policy making. This report will be released as a joint Statistics Canada-OECD publication.

Canadian reports will include a first report to present a comparison of the IALS data to LSUDA data; a second report that will focus on rare population subgroups for which LSUDA failed to provide sufficient sample; a third report that will reflect on the policy implications of the comparisons to other participating countries.

***Database***

***Name*** International Adult Literacy Survey (IALS)

***Description*** A public-use microdata file and associated documentation in electronic form containing results from the International Adult Literacy Survey (IALS), a nine country direct assessment of prose literacy, document literacy, and numeracy.

***To whom available*** All researchers.

***Restrictions*** Restricted access to microdata file January-December 1996. Interested users will be required to submit a research proposal, which will be vetted by a review committee. Data from 1997 file will be freely accessible.

***By what means available*** The file will take the form of a CD-ROM, which will contain the data file, extraction software, and related documentation.

***Charge to user*** To be determined.

***When available*** January 1996.

***For further Information about access to this database, contact:***

Jean Pignal
The Special Surveys Division, Statistics Canada
Ottawa, Ontario, Canada K1A 0T6
telephone: 613/ 951-3317
facsimile: 613/ 951-0562
electronic mail: pignjea@statcan.ca

*Funding* The European Community and IALS European participants have agreed to underwrite $200,000 of the estimated $400,000 cost of international overheads associated with the study. The National Center for Education Statistics has also agreed in principle to support the study and continue to search for the funds necessary to do so. The bulk of this money will be directed towards the purchase of services from the Educational Testing Service.

The Educational Testing Service has provided a proposal to Statistics Canada to cover their continued involvement in the study, and Statistics Canada, as study manager, has agreed to fund most of what has been presented. In addition, Statistics Canada has been working with the U.S. Bureau of the Census to develop a collection strategy for the U.S. linking study, which the National Center for Education Statistics can fund. This study, which would see the administration of a hybrid NALS/IALS assessment to 3,150 Americans, is a critical element in providing the statistical basis for placing other countries on the U.S. scales. NCES has also agreed in principle to sign an inter-agency agreement to cover this work.

*Information Sources*

T. Scott Murray, Assistant Director
Household Surveys, Statistics Canada
Ottawa, Canada K1A 0T6
telephone: 613/ 951-9476
facsimile: 613/ 951-0562
Internet: scotmur@statcan.ca

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1992 An International Assessment of Adult Literacy: A Proposal. Draft. December.

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NOTE: This study summary was reviewed and edited by T. Scott Murray at Statistics Canada in Ottawa on May 31, 1994; database information was provided by Murray on December 9, 1994.

## *INTERNATIONAL ASSESSMENT OF EDUCATIONAL PROGRESS*

*International Organization* Educational Testing Service

*Years of Data Collection*

**International Assessment of Educational Progress - I:** 1988
**International Assessment of Educational Progress - II:** 1991

*Purpose*

Since 1983 Educational Testing Service has administered the National Assessment of Educational Progress and related projects. NAEP is an ongoing, congressionally mandated project established to conduct national surveys of the educational attainments of students in the United States. Its primary goal is to determine and report the status of and trends over time in educational achievement. NAEP was initiated in 1969 to obtain comprehensive and dependable national educational-achievement data in a uniform, scientific manner.

**International Assessment of Educational Progress - I:** The purpose of IAEP-I was to collect and report data on what students know and can do, on the educational and cultural factors associated with achievement, and on students' attitudes. IAEP-I assessed mathematics and science achievement of 13-year-old students in the United States and five other countries. The United States joined with the five other countries to explore the feasibility of reducing the time and money requirements for international comparative studies by capitalizing on the National Assessment of Educational Progress materials and procedures. IAEP-I permitted interested countries to experiment with NAEP technologies to determine their appropriateness for local evaluation projects.

**International Evaluation of Educational Progress - II:** The purpose of IAEP-II was to collect and report data on what students know and can do, on the educational and cultural factors associated with achievement, and on students' attitudes. IAEP-II assessed mathematics and science skills of samples of 9- and 13-year-old students from the United States and 19 other countries, using technology developed for the National Assessment of Educational Progress. By utilizing existing NAEP technology and procedures, time and money required to conduct these international comparative studies was reduced and many interested countries were able to experiment with the innovative psychometric techniques.

Countries that participated are large and small, rich and poor, and have varied ethnic, religious, language, and cultural traditions. Educational goals, expectations, and the meaning of achievement vary among each of these countries. Each of the countries that participated did so for its own reasons: to compare its results with those of neighbors or competitors; to learn about the educational policies and practices of countries whose students seem to regularly achieve success in mathematics and science; to establish a baseline of data within its own country against which progress could be measured in the future.

All participants shared a common interest in identifying what is possible for 9- and 13-year-olds to know and to be able to do in mathematics and science. Knowledge of what is possible produces new enthusiasm, raises sights, establishes new challenges, and ultimately can improve personal and societal performance. The assessment information can be used by each

country to set goals and develop curriculums and practices in harmony with its own values and culture.

An optional geography component was included in this project, as a first step toward acquiring international measures of geography skills, knowledge, and education. Through this optional geography component, participants hoped to identify behaviors and practices that contribute to high levels of achievement, so that education policy makers would have information that might enable them to improve domestic performance in concert with national educational goals.

*Organization and Management*

**International Assessment of Educational Progress - I:** A project director, located at the Educational Testing Service, worked in collaboration with the National Foundation for Educational Research (UK); Ministry of Education and Science (Spain); New Brunswick, Ontario, and Quebec Ministries of Education (Canada); Laval University data analysts; and Educational Testing Service consultants.

**International Assessment of Educational Progress - II:** International coordination was done by staff of the Canadian Data Analysis Group, Educational Testing Service, and Westat. In all countries except Brazil and Mozambique an independent, trained observer interviewed the country project manager about all aspects of the project and visited one or more test administration sites. In most cases, the observer was fluent in the language of the assessment.

Decisions concerning the design and implementation of the project were made collaboratively by the representatives of the provinces and countries involved in the survey. The National Academy of Sciences/National Research Council's Board on International Comparative Studies in Education reviewed plans for the project at several stages of its development and made suggestions to improve the technical quality of the study.

*Design*

*Participants*

**International Assessment of Educational Progress - I:** Five countries and four Canadian provinces with extensive experience in large-scale assessment participated. (Canada does not have a federal system of education.) Twelve student populations were included from: British Columbia, Ireland, Korea, New Brunswick (English), New Brunswick (French), Ontario (English), Ontario (French), Quebec (English), Quebec (French), Spain, United Kingdom (sample drawn from students in England, Scotland, and Wales), and United States. Students were 13 years old (born January 1, 1974-December 31, 1974), and were selected from public and private elementary, middle, and secondary schools.

**International Assessment of Educational Progress - II:** Twenty countries assessed the achievement of 13-year-old students and 14 assessed 9-year-old students in mathematics and science. In some cases, participants assessed virtually all age-eligible children in their countries; in other cases they confined samples to certain geographic regions, language groups, or grade levels. In some countries significant proportions of age-eligible children were not represented because they did not attend school. Low rates of school or student participation in some countries mean results may be biased.

Country participation is as follows:

| | |
|---|---|
| Brazil | cities of São Paulo and Fortaleza, restricted grades, in-school population |
| Canada | four provinces at age 9 and nine out of 10 provinces at age 13 |
| China | 20 out of 29 provinces and independent cities, restricted grades, in-school population |
| England | all students, low participation at ages 9 and 13 |
| France | all students |
| Hungary | all students |
| Ireland | all students |
| Israel | Hebrew-speaking schools |
| Italy | province of Emilia-Romagna, low participation at age 9 |
| Jordan | all students |
| Korea | all students |
| Mozambique | cities of Maputo and Beira, in-school population, low participation (Mozambique did not assess Science.) |
| Portugal | restricted grades, in-school population at age 13 |
| Scotland | all students, low participation at age 9 |
| Slovenia | all students |
| Soviet Union | 14 out of 15 republics, Russian-speaking schools |
| Spain | all regions except Cataluña, Spanish-speaking schools |
| Switzerland | 15 out of 26 cantons |
| Taiwan | all students |
| United States | all students |

The geography portion of the IAEP was a special probe into the geographic knowledge and skills of 13-year-olds. Twenty countries assessed the mathematics and science achievement of 13-year-olds; of these 20 countries, nine countries also administered the optional geography component:

| | |
|---|---|
| Canada | eight out of 10 provinces |
| Hungary | all students |
| Ireland | all students |
| Korea | all students |
| Scotland | all students |
| Slovenia | all students |
| Soviet Union | 14 out of 15 republics, Russian-language schools |
| Spain | all regions except Cataluña, Spanish-language schools |
| United States | all students |

***Sample***

**International Assessment of Educational Progress - I:** A random sample of about 2,000 students from 100 different schools was selected from each population. In the United States, the sample size was about 1,000 students in 200 schools. A total of 24,000 students was assessed.

**International Assessment of Educational Progress - II:** Typically, a random sample of 3,300 students from about 110 different schools was selected from each population at each age level; half were assessed in mathematics and half in science. A total of about 175,000 9- and 13-year-olds (born in calendar years 1981 and 1977) were tested in 13 different languages in March 1991. Some countries drew samples from virtually all children in the appropriate age group; others assessed only children in specific geographic areas, language groups, or grade

levels. The definition of populations often followed the structure of school systems, political divisions, and cultural distinctions.

*Procedures and Summary of Content*

**International Assessment of Educational Progress - I:** All countries and provinces followed standardized administration procedures and administered the assessments during February 1988.

**International Assessment of Educational Progress - II:** Participants recognized fundamental differences from country to country, but assembled tests that focus on common curriculum elements. In order to form contexts for interpreting student achievement data, they added questions about students' home background and classroom experiences and the characteristics of the schools they attend. As a survey research project, this assessment could not establish cause-and-effect relationships, but it could provide clues that might help to explain high and low performance.

The IAEP-II assessment used a four-part survey: a main assessment of 13-year-olds' performance in mathematics and science; an assessment of 9-year-olds' performance in mathematics and science; an experimental, performance-based assessment of 13-year-olds' ability to use equipment and materials to solve mathematics and science problems; and a short probe of the geography skills and knowledge of 13-year-olds. All countries participated in the main assessment of 13-year-olds; participation in the other assessment components was optional.

Each participating country was responsible for carrying out all aspects of the project, including sampling, survey administration, quality control, and data entry using standardized procedures that were developed for the project. Several training manuals were developed for the project. Several international training sessions were held, during which each step of the assessment process was explained.

The assessment was developed through a consensus-building process that involved curriculum and measurement experts from each of the participating countries and provinces. Several existing NAEP frameworks and the IAEP-I framework were reviewed by participants and evaluated as to their appropriateness for their own countries' curriculums. Together, the participants then adapted the NAEP frameworks to reflect an international consensus of subject-specific topics and cognitive processes that they believed reasonably reflected curriculums being implemented in their own school systems.

The nine countries that participated in the geography component participated in the development of the geography framework that guided the design of the instruments. Curricular experts in each country reviewed the appropriateness of all potential questions for their own students.

Once the participants had agreed upon common frameworks and the relative emphases that would be placed on each topic and cognitive process category of the assessment, more than one-half submitted test items from their countries' own assessment programs that they felt were appropriate and met the requirements of the IAEP assessment. Many questions from the United States' NAEP assessments were included as well. The items with the highest ratings across all countries were placed into a pool of acceptable questions from which a subset was selected and pilot-tested in all of the participating provinces and countries.

While acceptable to all, the content areas measured in the tests were not equally representative of each country's curriculum and the multiple-choice question testing format was not equally familiar to students from all countries. Countries differ in the age at which students start school and in policies for promotion, students at age 13 were further along in their schooling in some countries than in others.

*Data Collection and Analyses*

**International Assessment of Educational Progress - I:** Students were administered a 45-minute mathematics assessment (63 questions) and a 45-minute science assessment (60 questions), selected from the total pool of 281 mathematics and 188 science questions used in the 1986 Unites States' National Assessment of Educational Progress. In addition, students answered questions about their school experiences and attitudes, and teachers rated students' exposure to the concepts tested by the items. The assessment was administered in February 1988, except in the United States, where the data were collected during the January-through-middle-March NAEP assessment.

Each country and province was responsible for developing a data file following a standard format, for checking ranges of responses, and resolving inconsistencies in the data. Quebec Ministry of Education staff also checked the files. ETS staff calculated weights for the United States and Canadian participants and verified weights for other participants. A Laval University (Quebec) research team conducted data analysis in consultation with ETS researchers and data analysts.

The first stage of analysis involved calculation of the percentage of correct answers and standard errors for individual questions and groups of questions. The second stage of analysis involved scaling of mathematics and science results using item response theory technology. The assessment collected opportunity-to-learn information to determine to what extent students in the participating populations had been exposed to various mathematics and science content areas covered in the IAEP questions.

Educational Testing Service measurement specialists worked with colleagues from five other countries to translate and adapt techniques used in the United States for the National Assessment of Educational Progress. Achievement results that permit comparisons and present valid and reliable findings were presented in A World of Differences: An International Assessment of Mathematics and Science. Each participating country had the opportunity to experiment with new measurement practices. Cost-effectiveness of sampling techniques, the power and limitations of Item Response Theory, and the usefulness of new reporting techniques were demonstrated. Experts in each participating country had hands-on experiences with problems and potential of new assessment techniques.

**International Assessment of Educational Progress - II:** The achievement tests lasted one hour. The tests given to 9-year-olds included 62 questions in mathematics and 60 questions in science. The tests given to 13-year-olds included 76 questions in mathematics and 72 questions in science. In addition, students at each age spent about 10 minutes responding to questions about their backgrounds and home and school experiences. Finally, students in countries assessing geography spent an additional 10 minutes responding to questions on geography. School administrators completed a school questionnaire.

National Center for Education Statistics commissioner Emerson Elliott emphasized factors to be kept in mind in interpreting the results of this assessment: 1) the importance of cultural

differences and of each country's educational traditions and practices and 2) the consensus process that produced the mathematics and science frameworks used in the development of IAEP II reflects only the curricular elements common to all participating countries.

Data analysis carried out between September and December 1991 involved checking dimensionality of the mathematics and science items at each age level through factor analysis techniques and item calibration on each of the dimensions established; computation of item and average percents correct; ability scoring using the plausible-values technology developed for the NAEP study; scale anchoring; and linkage of the two age groups.

Assessment results were obtained for 52 populations:

| Population | Language | 9-year-olds mathematics | 9-year-olds science | 13-year-olds mathematics | 13-year-olds science |
|---|---|---|---|---|---|
| Brazil | Portuguese | -- | -- | X | X |
| Canada | | | | | |
| Alberta | English | -- | -- | X | X |
| Br.Col. | English | X | X | X | X |
| Manitoba | English | -- | -- | X | X |
| Manitoba | French | -- | -- | X | X |
| NewBr. | English | X | X | X | X |
| New Br. | French | -- | -- | X | X |
| Newfound. | English | -- | -- | X | X |
| Nova Sc. | English | -- | -- | X | X |
| Ontario | English | X | X | X | X |
| Ontario | French | X | X | X | X |
| Quebec | English | X | X | X | X |
| Quebec | French | X | X | X | X |
| Saskatch. | English | -- | -- | X | X |
| Saskatch. | French | -- | -- | X | X |
| China | Mandarin | -- | -- | X | X |
| England | English | X | X | X | X |
| France | French | -- | -- | X | X |
| Hungary | Hungarian | X | X | X | X |
| Ireland | English | X | X | X | X |
| Israel | Hebrew | X | X | X | X |
| Italy | Italian | X | X | X | X |
| Jordan | Arabic | -- | -- | X | X |
| Korea | Korean | X | X | X | X |
| Mozambique | Portuguese | -- | -- | -- | X |
| Portugal | Portuguese | X | X | X | X |
| Scotland | English | X | X | X | X |
| Slovenia | Slovene | X | X | X | X |
| Soviet Un. | Russian | X | X | X | X |
| Spain | Spanish | X | X | X | X |
| Switzerland | French/ German/ Italian | -- | -- | X | X |
| Taiwan | Mandarin | X | X | X | X |
| United St. | English | X | X | X | X |

| Population | 13-year-olds geography option | 13-year-olds performance option |
|---|---|---|
| Canada | | |
| Alberta | X | X |
| British Columbia | X | X |
| Manitoba | X | – |
| New Brunswick | X | – |
| Newfoundland | X | – |
| Nova Scotia | – | X |
| Ontario | X | X |
| Quebec | X | – |
| Saskatchewan | X | X |
| England | X | X |
| Hungary | X | – |
| Ireland | X | – |
| Korea | X | – |
| Scotland | X | X |
| Slovenia | X | X |
| Soviet Union | X | X |
| Spain | X | – |
| Taiwan | – | X |
| United States | X | – |

Analysis of the second International Assessment of Educational Progress using item response theory technology was completed and almanacs of results were produced in 1992. A second volume of the IAEP Technical Report, which describes the steps in applying item response theory methodology, was also produced in 1992. This technical report describes the creation of a reference population that was used for all subsequent analyses. After ensuring that the reference population adequately represented each of the participating populations and met assumptions of unidimensionality, these data were used to calibrate item perimeters. Proficiency scores were then estimated, making use of plausible values technology. Each age group was scaled separately and then linked using the Stocking-Lord procedure. The resulting scale was assigned a mean of 500 and a standard deviation of 100. Average proficiency scores were then calculated for participating populations, following the same procedures used for the percent correct analyses.

Secondary analysis of IAEP results. The Educational Testing Service Center for the Assessment of Educational Progress prepared two short reports that focus on implications of the IAEP results for U.S. efforts at standard setting and curriculum reform. These reports, written in collaboration with U.S. mathematics and science educators, make use of item-by-item results and comment on what students in the United States know and can do well and where U.S. students fare behind student peers in other countries. They will be published by the National Science Foundation.

***Timetable***

**International Assessment of Educational Progress - I:**

1987-1989

Project implementation was carried out through a series of meetings to select assessment items, review pilot-test results, and review and interpret final results. Decisions were made collaboratively; follow-up coordination was provided by ETS staff.

**International Assessment of Educational Progress - II:**

1989 Pilot testing was conducted November 1989-February 1990.
1990 The pilot review meeting was held in Montreal. (May)
Data was collected in the southern hemisphere. (September)
1991 Data was collected in the northern hemisphere. (March)
1992 Reports were published on results of IAEP geography, mathematics and science.
An almanac of results of IAEP using item response theory published.
Two volumes of the IAEP Technical Report were published.

***Publications***

A World of Differences: An International Assessment of Mathematics and Science. Report of the International Assessment of Educational Progress. Educational Testing Service. (1989)

A World of Differences: Technical Report. Report of the International Assessment of Educational Progress. Educational Testing Service. (1989)

Learning Mathematics. Report of The International Assessment of Educational Progress. Educational Testing Service. (1992)

Learning Science. Report of The International Assessment of Educational Progress. Educational Testing Service. (1992)

Learning Geography. Report of the International Assessment of Educational Progress. Educational Testing Service. (1992)

Performance Assessment: An International Experiment. Report of the International Assessment of Educational Progress. Educational Testing Service. (1992)

IAEP Technical Report. Report of the International Assessment of Educational Progress. Educational Testing Service. (1992)

IAEP Technical Report: Volume Two. Report of the International Assessment of Educational Progress. Educational Testing Service. (1992)

Two short reports on implications of IAEP results for U.S. efforts at standard setting and curriculum reform will be published by the National Science Foundation.

***Funding***

**International Assessment of Educational Progress - I:** Funding was provided by the U.S. Department of Education and the National Science Foundation for overall coordination,

sampling, U.S. data analysis, and reporting. Participating countries and provinces acquired support for local data collection and coordination.

**International Assessment of Educational Progress - II:** Funding was provided by The National Science Foundation and the U.S. Department of Education's National Center for Education Statistics provided a grant for the expenses of overall coordination, sampling, data analysis, and reporting. The Carnegie Corporation provided additional funds to cover the travel expenses of some of the participants who could not meet the financial burdens of traveling to the project's coordination and training meetings, held in Canada, England, France, Hong Kong, and the United States. Participating countries acquired support for local data collection and coordination.

***Information Sources***

Nancy A. Mead, International Coordinator/Project Director
Center for the Assessment of Educational Progress
Educational Testing Service
P.O. Box 6710
Princeton, New Jersey 08541-6710
telephone: 609/ 734-1526
e-mail: nmead@rosedale.org

Educan Inc.

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NOTE: This study summary was reviewed and edited by Nancy Mead at the Educational Testing Service on June 10, 1994.

## *INTERNATIONAL COMPARATIVE STUDY OF MATHEMATICS AND SCIENCE TESTS*

***International Organization*** The National Center for Improving Science Education

***Years of Data Collection*** 1993

***Purpose*** The establishment of U.S. national goals, the push toward better means of assessment, and efforts to set standards for school science have led to a great interest in defining world-class standards in mathematics and science achievement of precollege students. One persistent question is the achievement expectations for students preparing for university admission in science or mathematics and/or planning to major in these fields. Therefore, the National Center for Improving Science Education will analyze the current mathematics and science tests given to students seeking university admission in several industrialized countries.

The aim is to develop more knowledge about how mathematics and science tests intended for the most accomplished students differ across countries, what can be inferred from the analyses of such tests about learning standards set for students in these countries, and how U.S. mathematics and science tests can be improved to match the standards of other countries. The National Center staff believe that their approach to this work not only will inform U.S. policy but will contribute to international understanding of educational expectations embodied in tests and the place of testing in national education policy.

***Organization and Management*** The project is guided by an advisory panel that reviews drafts of the chapters and of the complete report and helps to refine dissemination plans. The study is taking place over a 28-month period (September 1992 - January 1995), during which an advisory panel was formed and experts contacted. Other activities include establishing a structure for analysis and reporting; selecting, collecting, and translating tests; analyzing tests and writing findings in a final report; and implementing a dissemination plan.

***Design***

> ***Participants*** Advanced-level examinations in mathematics and science (biology, chemistry, physics) have been obtained from France, Germany, Great Britain, Israel, Japan, Sweden, and the United States.
>
> ***Sample*** The populations for tests selected and analyzed closely match Population 3b, the "mathematics and/or science specialist" population defined for TIMSS.

***Procedures and Summary of Content*** The scope of work of the International Comparative Study of Mathematics and Science Tests complements the work of the IEA Third International Mathematics and Science Study (TIMSS). The science and mathematics frameworks developed for TIMSS were augmented and used to analyze the content and performance expectations of the selected tests. To the extent possible, TIMSS participant survey questionnaires will be used to gather data on what sorts of students are taking the tests to be analyzed, how the tests are used in each of the countries, and other contextual factors. The test analysis project is being carried out in conjunction with TIMSS leadership; there is an overlap in personnel; and all countries selected to participate in this study are participating in TIMSS.

***Data Collection and Analyses*** The International Comparative Study of Mathematics and Science Tests is working closely with the TIMSS International Coordinating Center to collect the tests.

University of British Columbia graduate students are translating tests that were not provided in English.

Examinations collected for analysis are in the fields of mathematics, physics, chemistry, and biology. For each country, each field, and pertinent type of test, the two latest years of tests available will be collected, in order to have an adequate representation of the domain of knowledge and performance expected of students. Expected responses or response protocols and scoring rubrics is included.

Exams Included in the National Center for Improving Science Education Analysis

| Country | Years | Type | Regions |
|---|---|---|---|
| France | 1991, 1992 | Baccalaurèat | Paris; Aix |
| Germany | 1991, 1992 | Abitur | Bavaria; Baden-Württenberg |
| Israel | 1992 | Matriculation | -- |
| Japan | 1991, 1992 | University Entrance | Tokyo University |
| Sweden | 1991, 1992 | National Exam | -- |
| United Kingdom | 1991, 1992 | A-level | Associated Examining Board; University of London Examinations and Assessment Council |
| United States | varied, 1993 | Advanced Placement | -- |

In 1994 an international team of researchers assembled by the National Center for Improving Science Education analyzed national examinations in mathematics and science (biology, chemistry, and physics). Research team members and study advisors, drawn from the United States and other countries, included eminent experts in science and mathematics education. The exams compared were end-of-secondary school tests, given to college-bound science and mathematics students, from seven countries.

Analysis of the tests in mathematics and in each of the science fields, used the TIMSS mathematics and science curriculum frameworks (mathematics, John Dossey; biology, Pinchas Tamir; physics, Kjell Gisselberg; chemistry, Dwaine Eubanks). Each of these experts will produce a chapter on the results of the test analyses across countries together with an overview and conclusions regarding the achievement and performance expectations for advanced students in the specific subject. A summary chapter will be added synthesizing the separate reports on each of the fields and providing overall conclusions. Analyses and draft chapters will be reviewed by prominent senior researchers (Paul Black, physics; Angelo Collins, biology; Dorothy Gabel, chemistry; Curtis McKnight, mathematics; and Jack Schwille, comparative education). Two major components of the study are item-by-item categorizations of the tests' (1) topics and (2) expectations for student performance. To inventory these two characteristics, researchers developed supplemented versions of the Science and Mathematics Curriculum Frameworks from the Third International Mathematics and Science Study (TIMSS). Consequently, researchers had between 50-75 subject matter categories available (per subject), nested in three hierarchical levels, to describe an item's topic.

Researchers used multiple categories to describe an item's topic as needed. All researchers also used a second dimension of the TIMSS curriculum frameworks to describe each item: expectations for

student performance. Twenty categories were available, including, e.g., understanding of simple information, developing explanations using scientific principles, and solving quantitative problems.

Many other features of the exams were compared. Nine categories were used to document the formats of questions, e.g., multiple choice questions (3, 4, or 5 response options), open-ended (types of short-answer questions, types of extended-answer questions), and practical tasks. Researchers also inspected the wording of items (e.g., whether questions were stated negatively or positively) and the demands of problem-solving questions (e.g., whether questions merely required set-ups for solution or completely worked solutions.) Finally, more global exam features were noted such as length of exams and kinds of options included (or not) for students to select questions.

In late 1994 the report on detailed comparative analysis of exams will be published. Researchers compared three main characteristics of the tests: topics covered, expectations for student performance, and types of questions. The Center's international team also compared the overall lengths and components of the tests, the amount of choice students have in selecting questions, the complexity of the topics covered, and wording devices used in constructing questions. There is only one exam from each year in the report, which is too few exams for determining the range of topics that national exams typically assess. A full range of topics would require inspection of several years of exams; however the Center's analysis of exams from two years will go a long way toward showing the range of topics included in the exams of other countries.

Exam topics in the Center's report are described using detailed categories that the Center helped to develop for a the Third International Mathematics and Science Study (a large-scale international study involving a large number of countries). The topic of each exam question is noted using three levels of increasingly detailed topic categories; then each exam's topics are summarized, making comparisons among exam topics possible. The report addresses what kinds of processes students must use to answer exam questions: whether students must give information by rote, or solve quantitative problems, or give explanations based on scientific principles. Categories known as "student performance expectations," which the Center helped develop for the TIMSS study, were used to describe student performance. Five main categories (understanding, solving problems, using tools and procedures, investigating and communicating) and 15 sub-categories were employed. The report extensively discusses difficulty of exams and considers many factors that should be brought to bear when making comparisons between the "difficulty" of different countries' exams.

In May 1994, the National Center and the American Federation of Teachers copublished What College-Bound Students Abroad Are Expected to Know About Biology. The volume contains university entrance exams from England and Wales, France, Germany, and Japan, and a U.S. Advanced Placement biology exam, as well as comparative descriptions of those nations' examination systems. Release of this report drew considerable media attention. It is recommended by the National Science Teachers Association and the National Association of Biology Teachers.

***Timetable***

1993 Exams were collected.

1994 National examinations in mathematics and science were analyzed.
A report of comparative examination descriptions was published.
A monograph will be published. (late 1994)

1995 A final report will be published.

***Publications***

What College-Bound Students Abroad Are Expected to Know About Biology. National Center for Improving Science Education and National Federation of Teachers. (May 1994) (Similar publications on chemistry and physics are proposed.)

The end product will be a monograph released late in 1994 that should be of considerable interest to policy makers and scholars concerned with standards in mathematics and science and with testing. A number of diverse strategies will be used to disseminate the results of this study as widely as possible.

***Funding*** Funding is provided by the National Science Foundation.

***Information Sources***

Senta A. Raizen, Director
The National Center for Improving Science Education
2000 L Street, N.W., Suite 603
Washington, D.C. 20036
telephone: 202/ 467-0652
facsimile: 202/ 467-0659
e-mail: sentar@gwuvm.gwu.edu

Ted Britton, Project Director
The National Center for Improving Science Education
2000 L Street, N.W., Suite 603
Washington, D.C. 20036
telephone: 202/ 467-0652
facsimile: 202/ 467-0659
e-mail: tbritton@gwuvm.gwu.edu

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NOTE: This study summary was reviewed and edited by Ted Britton at the National Center for Improving Science Education in Washington, D.C. on May 31, 1994.

## *INTERNATIONAL STUDY OF TEACHERS' ATTITUDES TOWARD REFORM AND TEACHER PREPARATION FOR IMPLEMENTING REFORM*

***International Organization*** George Washington University Institute for Curriculum Standards and Technology

***Purpose*** This study will be a cross national study of teachers' perceptions of critical issues facing schools, major reforms being implemented to improve the quality of education, and the conditions necessary for the successful implementation of the reforms. The purpose of the study is to ascertain teachers' views of education reforms being implemented in their country. The study also will be designed to ask teachers what their needs are in terms of training and professional development experiences to implement the reforms.

Other recent studies about education reform initiatives have focused on the viewpoints of policy makers. This study is unique in that it will directly involve classroom teachers in assessing the impact of education reforms on classrooms.

The study will first determine whether education reform is occurring in the Washington, D.C.-Virginia-Maryland metropolitan area and whether teachers' professional development programs have been (re)designed to support the reform efforts; and then conduct an international study of teachers' attitudes toward reform and teacher preparation for implementing reform.

***Organization and Management*** The plan is to work through Education International, a union representing 20 million teachers and allied school personnel worldwide. A member of the association in each country will be asked to manage the country survey of teachers. Dennis Holmes and Marsha Levine are part of the team conducting the study. A person with recognized experience in conducting international studies will be invited to serve as a consultant to the project.

The Institute will work with Education International to identify teacher organizations in 8-12 OECD countries to work with the Institute in conducting the study. A representative from the teacher organization(s) in each country, along with a contact person from the Minister or Secretary of Education's office will be asked to help the Institute implement the project.

***Design***

***Participants***

Pilot test: Washington, D.C.-Virginia-Maryland metropolitan area teachers, staff development personnel, and the respective superintendents.

International study: teachers and allied school personnel in 8-12 OECD countries. Schools involved will be jointly selected by the Secretary/Minister of Education and the Education International member organized in each country.

***Sample***

A contact person from the Minister or Secretary of Education's office will be asked to provide a list of teachers to be considered for possible inclusion in the sample population. The sampling plan will have to be designed to take into account the different ways that school systems are organized in each of the participating countries. The Institute will work with the

contacts in each country to design an appropriate sampling plan and the actual survey instrument.

*Procedures and Summary of Content* A study on teachers' professional development and its relationship to implementing education reforms is presently being piloted. This study is being conducted in the United States and involves the eight school districts in the Washington, D.C.-Virginia-Maryland metropolitan area. In particular, the study will attempt to determine whether education reform is occurring in these districts and whether teachers' professional development programs have been (re)designed to support the reform efforts. It will involve teachers, staff development personnel, and the respective superintendents.

In March 1994 Mary Futrell chaired a meeting convened by the Education International of leaders of all of its member organizations in OECD countries to discuss education reform. In June, Education International reconvened the same group and invited the Ministers/Secretaries of Education from the OECD countries to meet with us to explore major issues related to education reform in more detail. The contacts made and information gathered as a result of the meeting with the teacher leaders and the Ministers/Secretaries will be used as part of the international study. The pilot study results will be used to finalize design of the prototype for the George Washington University international study. A full proposal for the study will be developed during the summer of 1994.

*Timetable*

1993 The exploratory phase was completed; a proposal for the study was developed.

1994 A study in the United States on teachers' professional development and its relationship to implementing education reforms is being piloted.

1994 A full proposal for an international study is being developed.

*Funding* Federal agencies and/or foundations will provide funding.

*Information Sources*

Mary Hatwood Futrell, Director
Institute for Curriculum, Standards and Technology
George Washington University School of Education and Human Development
2201 G Street, N.W.
Washington, D.C. 20052
telephone: 202/994-2304
facsimile: 202/994-7207

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NOTE: A draft of this study summary was reviewed and edited by Mary Futrell at George Washington University in Washington, D.C. on July 11, 1994.

## *LANGUAGE EDUCATION STUDY*

***International Organization*** International Association for the Evaluation of Educational Achievement (IEA)

***Years of Data Collection*** 1995: National policy profiles
1997: Case studies and survey of students, teachers, and schools

***Purpose*** Education in languages is important everywhere in the world, and its importance increases as societies change, assess their expectations for what schools can do, and evaluate their economic positions internationally and human resources nationally. Major transformations in how languages are taught; used in work and daily life; and valued for all aspects of personal, academic, business, and societal opportunity have occurred within the past 20 years.

Education in foreign and second language is important throughout the world. Some global trends that make languages in education especially prominent at this time are:

- Restructuring of international economic and political agreements require common, facilitating languages as well as new priorities in the languages needed by specific nations to realize these relations through workers' skills, for labor mobility, cooperation, and awareness across cultures.
- Most academic, technical, scientific, and financial information is now being coded into a few languages, making knowledge of these languages necessary to realize social, intellectual and economic advances in all parts of the world.
- Increased global migration has created massive demographic shifts between so-called developed countries and from rural to urban areas, making language education for migrant or immigrant populations increasingly essential for social participation and harmony as well as occupational opportunities.
- The foregoing trends are prompting many societies to lose the language resources of indigenous or minority populations, resulting in increased calls for public institutions to accommodate and capitalize on ancestral heritages and multi-linguistic diversity.

Comparative information and research to assess these trends are needed by:

- policy makers who have little current data at their disposal to determine the effectiveness or impacts of existing programs
- business and industry that need reliable indices to determine or forecast current capacities for future needs
- educators who lack a systematic data base on language education to raise awareness of curriculum or instructional choices
- consumers of language education who lack choices about language options and instructional programs in the absence of clear-cut information
- educational researchers who lack empirical data to form a comprehensive international perspective of educationally-relevant theories and recommendations for teaching practices of school policies in language education

The IEA Language Education Study will address these issues systematically in order to develop a comprehensive international information base focused on four purposes:

- To determine the yield of language curricula in different countries. What percentage of students reach a basic, threshold level of proficiency in specific languages? What percentages reach an advanced, fluent proficiency? What differences in yield exist between and within countries?

- To describe the scope and content of language curricula in different countries. What are the key features of foreign and second language curricula (number of languages taught, levels of student participation, starting ages, duration, intensity)? What exemplary possibilities for foreign and second language education exist?

- To identify the factors related to differences in yield in language curricula. To what extent are the difference in yield at the national level, the school level, and the individual level related to differences in curricula for language education? What is the impact of out-of-school opportunities on the learning and uses of foreign and second languages? To what extent do such relations between yield, curriculum factors, and environmental factors vary within and between countries?

- To assess needs and promising options for changes in foreign and second language curricula. Is the yield of language curricula sufficient for societal purposes in specific countries and educational jurisdictions? Which aspects of foreign and second language curricula call for change?

There is no precise, authoritative information on what language education is accomplishing around the world. Few countries know accurately what their own systems for language education are doing, how successful their language programs are in terms of national priorities, how useful they are for which types of students or purposes, or how they may compare to those of neighboring countries. The IEA Language Education Study is an effort to gather this information, which will be useful for educational policy and practice planning, and for socio-economic planning as well.

This comparative survey of language education will:

- Determine what school systems around the world do and produce in language teaching and learning.
- Develop international assessment standards and tests to define basic and advanced levels of communicative competence in key languages.
- Describe the scope and content of school language curricula as well as societal conditions directly related to language learning.
- Identify optimal configurations for school language learning appropriate to national priorities and situations.
- Describe exemplary cases of school language teaching and learning, along with noteworthy innovations internationally.
- Assess needs and recommend promising options for change in participating countries.

This study will provide:

- overview information on national policies for education in foreign, second, and minority languages in about 60 countries
- descriptions of language curricula based on surveys of students, teachers, and schools representative of secondary education in about 30 countries
- descriptions, using internationally-validated tests, of the proficiency for communication that students in about 30 countries achieve in English, French, German, and other commonly

taught languages at (1) the end of the compulsory schooling and (2) upon completing secondary education

- o case studies of exemplary practices in language teaching and learning in about 15 countries
- o recommendations of needs and promising options for change in school language curricula for each participating country

The study will help participating countries to promote the value of functional communicative competence in key languages, capitalize on resources and the highest levels of research expertise coordinated internationally, as well as learn about and critically analyze their own language education systems and current conditions for language learning. Results will be useful for governments, educators, businesses and industries, and researchers, as well as language students and their families.

***Organization and Management*** The National Foundation for Education Research in England and Wales has been designated as the international coordinating center. This designation was made through a process of sending the proposal out for bids by potential international coordinating centers. The international coordinating center has the responsibility to coordinate the study and for the final results and reports, which includes: research design (including the time line and analysis plan), instrument development, data analysis, and reporting. Additional responsibilities that are generally common to all IEA studies (fund raising, field operations [including sampling procedures, standardized manuals, data collection, training of national research coordinators' field monitoring], and data management) are the responsibility of the international coordinating center or the IEA headquarters, as determined by mutual agreement and approved by the Language in Education Study's International Steering Committee and the IEA Standing Committee.

The IEA Standing Committee will define how the international coordinating center will coordinate with IEA headquarters; negotiations between the ICC and headquarters will determine how and by whom data will be collected and who will have responsibility for other aspects of the study. Either the ICC or the IEA headquarters may contract out activities. Other responsibilities are to be in accordance with IEA by-laws (IEA Guidebook 1993, Section 8, Appendices pages 173-175).

The international coordinator is located at and manages the international coordinating center. He is responsible for the international aspects of the study, is the senior research officer of the study, is responsible to the General Assembly and Standing Committee, serves ex officio on the International Steering Committee, and oversees the work of national research centers. The coordinator has responsibility to maintain communication about the study with all participating countries, the International Steering Committee, and other interested persons; provide documentation on all basic components of the study; manage the international funds of the study according to budgets and other policy decisions of the General Assembly; arrange for and act as rapporteur of meetings of the International Steering Committee and the International Project Committee; arrange meetings of national project coordinators and other meetings associated with the study; ensure agreed deadlines for the study are met by all participants; arrange for conduct of all phases of the study; arrange for incorporation of basic cross-system data into suitable archives for secondary analysis; and arrange for planning and writing of all international project reports and publications.

The international coordinator has responsibility to appoint a project manager to manage all stages of the study and appoint a data manager to organize the international data processing centers. The international coordinating center has responsibility to: prepare all instruments, manuals, codebooks, and documentation and check all constructs at the pilot stage; monitor sampling in cooperation with the sampling referee; arrange for the continuous training of national project coordinators; prepare data entry, cleaning and merging programs to be used by the national research centers; prepare and test all programs required for international statistical analyses; check incoming data sets and documentation;

document all stages of data processing procedures; ensure printouts can be easily read and interpreted; prepare graphics and software and secure appropriate hardware services; and provide each participating center with appropriate documentation and software.

A Steering Committee has been established for this study. Its membership includes Alister Cumming (chair), OISE, Canada; Francis Debyser, CIEP, France; Kees de Glopper, University of Amsterdam, The Netherlands; Elana Shohamy, Tel Aviv University, Israel; John Trim, Council of Europe; G. and Richard Tucker, Carnegie Mellon University, U.S.A.

***Design***

***Participants*** Twenty-five IEA member countries have expressed interest in participating in the study. Some are interested in participating in regard to foreign languages widely used for international communication. Further interest exists for optional studies of education in second languages (education in a majority language for ethnic, immigrant, or regional minorities on a specific country). This interest focuses on education for social interaction and academic studies and will address diverse populations as well as complex factors in local societal contexts.

The United States (as a whole nation or selected states) might choose to participate in the whole study or some of four parts of the study (national language education profiles; survey of student language proficiency for two populations; survey of language teaching and learning; case studies of exemplary, successful schools). This decision would depend on the nature and focus of the study (for example, which language/s is/are included) and on available funding. Most countries want to focus on English; the United States would be interested in Spanish as a foreign language, and in English as a second language.

***Sample*** Simple, but sophisticated sampling techniques will be used, to keep numbers of students and schools involved to a minimum while achieving representative sample populations. At the first stage of sampling, schools will be sampled with probability proportional to their size, at both population levels. At the second stage of sampling students will be sampled randomly within schools. There will be no sampling of intact classrooms; consequently school effects and classroom effects cannot be separated. The study will aim for an effective sample of 400 students for those proficiency measures that will be collected from all students (i.e., reading and listening comprehension). The precision of estimates of population values will thus be + or - 5 percent of a standard deviation for any given variable.

For other skill domains (typically writing and speaking) students will be sub-sampled (typically 5 students per school per skill); the effective N aimed for will be 200 students. Between 20 and 30 students will be tested per school. Stratification will be employed in the preparation of the sample designs, in order to enhance sampling accuracy. Students will be tested in one language only. Countries testing multiple languages may opt for separate samples of schools, one school sample for each language, or for sampling separate student groups within a common sample of schools.

***Procedures and Summary of Content*** The study will assess language proficiency as the capacity to use a particular language appropriately and accurately to achieve social purposes in particular contexts (both inside and outside of school). It will address various competencies and domains of language use, rather than limiting itself to traditional testing of students' knowledge of grammar and vocabulary. Assessment will consist of focused and integrated tasks (tasks that require students to

communicate interactively, such as reading and writing in conjunction, or speaking and listening in ongoing conversations).

School policies for foreign language education can be readily identified and compared internationally, and they form the principal focus for the of this study. School policies for second language education are considerably more complex, interact with local social contexts, and vary in curriculum realizations, which makes them suitable as optional components of the study according to interests and situations of specific countries.

Previous research points the way to many learning and curriculum variables, design issues, test characteristics, and sampling requirements that this study can adopt. For example, empirical studies of students' language performance have generally found variation according to such factors as situations of language use or communication tasks; previous education or literacy; age factors; time spent on language learning; structures or features of particular first and second languages; attitudes toward the society or culture of the language being learned; and the status and use of the languages in the local community.

Numerous curriculum and instructional variables have also been analyzed, though few have received rigorous, large-scale empirical evaluation: instructional approaches or didactic procedures; curriculum content and organization; and effects of specific media, technologies, or resources for language learning.

The core study and options design is as follows:

| Core Study | | Options |
|---|---|---|
| Foreign Language Education | | Second Language Education |
| | Curriculum yield | |
| Population:<br>15- and 18-year-old students | | Population:<br>9-year-old students and adults |
| Communicative competence | | Academic skills |
| | Curriculum scope and content | |
| Survey of teachers, schools, students, and national situation | | Case studies of exemplary programs |
| | Effective factors analyses of relations between yield, curriculum, and content | |
| | Options for change | |
| Survey findings | | Case study findings |

*National profiles inventory:* This first phase of the study will provide at-a-glance overviews of the general context and policies for language education in each country. Findings will identify key policy issues and factors in school contexts broadly influencing curricula and students' learning in specific

languages. A survey report form will be conceived, designed, pilot-tested, and then distributed to all participating nations, as well as other nations that (because of limited resources or interest) will engage in this part of the study only. Data collection (scheduled for January 1995) will be reported initially (scheduled for November 1995) in the form of an inventory booklet; then a more extensive compendium reference document will be published the following year.

*Language proficiency assessment:* A major portion of work during the study will be devoted to developing, conducting, and analyzing results from assessments of student language proficiency -- all coordinated centrally through the international coordinating center. The study will produce and validate a common set of tests to assess the proficiency that students achieve to communicate in speaking, listening, reading, and writing in key languages, as selected by each country. Results will indicate the yield of school systems overall in terms of the percentage of students achieving either (1) threshold or (2) fully proficient levels of communicative competence at (1) the end point of compulsory schooling and (2) the completion of secondary schooling.

*Descriptions of language curricula:* Work on questionnaires for school administrators, teachers, and students will follow a schedule similar to that for language proficiency testing. Questionnaires will survey representative samples of students, teachers, and schools to describe their characteristics and a wide range of resources and practices related to language curricula and learning -- assessing the fit between resources available and those most frequently used in practice in each country. After developing and pilot-testing instruments in 1996 and data collection in 1997, results will be reported in booklet form (scheduled for early 1998), followed by national reports and a full international report (later that year), incorporating results of language assessments as well.

*Case studies:* To assure that this aspect of the study is sensitive to the interests of participating countries, initial consultations will review options for case study inquiry (classroom observations, ethnographic interviews, narrative techniques, teacher action research), determine common analytic purposes and frameworks, and link the design to issues highlighted in the national profiles inventory for each participating country. Case studies will provide vivid, holistic portraits of exemplary practices in language teaching and learning. Illuminating in depth what actually happens in innovative, successful classrooms, this aspect of the study will provide educators with concrete, practice-based models of the experiences and conditions of language education. Building on initial results from surveys and proficiency assessments, case studies will be conducted in certain countries (scheduled for 1997), which will produce a booklet, then a detailed compendium of results (1988)

*Language proficiency yield, optimal configurations of language curricula, needs and options for change:* In the final year of the study, data analyzed from the national profiles inventory, language proficiency assessments, descriptions of language curricula, and case studies will be compiled and evaluated centrally to produce tables and reports on language proficiency yield, curriculum descriptions, and optimal configurations of language curricula. Project centers will prepare national reports as well as reports on needs and promising options, ensuring they are relevant to local situations. Analyses, preparation of major books, writing of articles, and public presentations will proceed intensively through this final year but continue, according to the interests of participating researchers, for several years following the completion of the project.

Information from the surveys, testing, and case studies will be synthesized to identify -- in respect to the goals and societal contexts of each participating country -- optimal configurations for school language education, specific needs in each country, and promising options for change. National reports are scheduled for publication in late 1988. An overview booklet will identify (1) key variables amenable to manipulation within educational systems to improve language achievement as

well as (2) major differences in societal contexts between countries that affect language acquisition and use.

***Timetable***

1993 An amended study proposal was approved by the IEA General Assembly.
A specific set of responsibilities for the international coordinating center and procedure for agreement between the ICC and IEA headquarters on other responsibilities related to the study approved by IEA General Assembly was determined.

1994 The international coordinating center and international coordinator were designated through competitive bidding.
Funds are being raised by IEA headquarters.
A Steering Committee was established.
Member country participation will be established.
National Project Coordinators will meet (late 1994).
The study design will be discussed by the IEA Standing Committee.
Instruments and procedures will be developed.
The proposed timetable is likely to be altered by a decision of the General Assembly.* (August)

1995 National policy profiles data collection is scheduled. (January)
Initial reporting of policy profiles data collection is scheduled. (November)

1996 Survey of students, teachers, and schools pilot testing instrument will be developed.

1997 Survey of student, teacher, and school data will be collected.
Case studies will be conducted in certain countries. A booklet of case studies will be published.

1998 Results of the survey of students, teachers, and school will be reported in a booklet. (early 1998)
National reports and a full international report on the survey of students, teachers, and schools, including language assessments, will be published. (late 1998)
A detailed report of results of case studies will be published.
National reports of a synthesis of information from the survey, testing, and case studies will be published. (late 1998).

* It is expected that the first year of the study will be confined to work on the national profiles inventory, with the survey element postponed for one year.

***Publications*** Case studies will be reported first in a booklet, and then in a detailed report of the results. The survey of students, teachers, and schools will be reported first in a booklet, and then in national reports and a full international report, which will include language assessments. National reports of a synthesis of information from the survey, testing, and case studies will be published.

***Funding*** IEA headquarters is seeking funding from foundations, international organizations, and countries other than the United States. The United States will not be a principal or major funder of

the coordinating center or international activity. The National Center for Education Statistics may provide a small amount for the U.S. national center.

*Information Sources*

Peter Dickson, International Coordinator
National Foundation for Educational Research
in England and Wales
The Mere, Upton Park
Slough, Berkshire SL1 2DQ ENGLAND
telephone: 44-7-53-74-12-3
facsimile: 44-7-53-69-16-32
Internet: EZUE100@VMSFE.ULCC.AC.UK

International Association for the Evaluation of Educational Achievement Secretariat
14 Sweelinckplein
NL 2519 The Hague, THE NETHERLANDS
telephone: 31-70-346-96-79
facsimile: 31-70-360-99-51
e-mail: IEA@SVO.NL

Gordon M. Ambach, U.S. Liaison to IEA
Council of Chief State School Officers
One Massachusetts Ave., N.W., Suite 700
Washington, D.C. 20001-1431
telephone: 202/ 408-5505
facsimile: 202/ 408-8076
e-mail: gambach@nas.edu

International Association for the Evaluation of Educational Achievement

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Selden, Ramsay

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NOTE: This study summary was reviewed and edited by Peter Dickson at the National Foundation for Educational Research in England and Wales (NFER), in Berkshire, England on July 11, 1994.

## *NEW STANDARDS PROJECT (benchmark activities)*

***International Organization*** Learning Research and Development Center at the University of Pittsburgh and the National Center on Education and the Economy

***Years of Data Collection*** Ongoing from 1993

***Purpose*** The New Standards Project is a voluntary association committed to the joint development of new standards and new examination systems for U.S. schools. The goal is to improve student performance radically by using standards and assessments as instruments for comprehensive and systemic reform of American education. The 25 state and district Partners in the New Standards Project are developers and users of a system of assessments based on portfolios, projects, and performance tasks, employing the content and performance standards defined by groups such as the National Council of Teachers of Mathematics. The Partners seek mutual association in order to link their own assessments to a shared national standard. It is intended that the standards used in the development of assessments will be internationally competitive.

A process of collaborative benchmarking of education standards has been defined by which several countries can compare their educational standards and expectations. This process is designed primarily to serve the New Standards Governing Board in its standards-setting process. The Board needs information from high achieving nations about their content and performance standards in mathematics, language arts, and science for key transition points in a child's schooling career. With this information, the Board will be prepared to assure the New Standards Partners that they are linking to a system of internationally competitive content and performance standards.

***Organization and Management*** The New Standards Project co-directors are located at the Learning Research and Development Center at the University of Pittsburgh and the National Center on Education and the Economy. A coordinator for international benchmarking is located at the Learning Research and Development Center. The project is also served by a consultant.

***Design*** New Standards International Benchmarking is a case study. Data collection includes interviews with teachers and other education specialists, examination and translation of documents related to education, and collection of graded student work samples.

***Participants***

Australia, Great Britain, France, Germany, Japan, the Netherlands, Sweden, and the United States. New Standards is benchmarking U.S. mathematics standards/tasks/portfolios with mathematics education in Australia, France, Japan, the Netherlands, and Sweden; it hopes to add Germany and Great Britain. Other countries will be used in language arts and science.

***Sample***

Case studies.

***Procedures and Summary of Content*** The benchmarking model begins with data collection aimed at describing the standards and procedures used by appropriate counterparts in a field of endeavor. Rather than trying to convert all standards to a common metric, benchmarking describes what others

are doing in their own terms and within their own system of values. This is different from other comparative efforts that focus on how students perform on a test of common items.

A carefully chosen set of questions about issues serves as the framework for collaborative international benchmarking. The New Standards process for collecting benchmark information engages a set of collaborators from several countries in generating information that can be used by educators and policy makers in each country. The common descriptors do not force an artificial structure on the systems investigated. Rather, the common set of questions yields a description of each country that sets various elements of its goals and standards practice in a systemic context.

The collaborative benchmarking model employs a set of common questions in order to obtain descriptive and contextualized comparisons of goals and standards. The result is a set of rich descriptions of the educational standards of each participating country. Once the standards are understood through the collaborative benchmarking research process, presentation formats can be customized to present decision makers in each country with the information they need to inform their own decision making. Decision makers include teachers and other education professionals, parents, legislators, other policy makers, and the general public. Benchmarking does not imply that goals and standards found desirable in other countries will necessarily be adopted; it holds only that the experience of other countries can be useful in setting goals and standards at home.

***Data Collection and Analyses*** The six organizing questions for the New Standards benchmarking process are:

- What is the structure of the education systems in comparison countries? What are the key transition points and decision points for students?
- What are students in other countries expected to know and be able to do at key transition points in their schooling careers?
- What kinds of performances are used to demonstrate competence?
- What counts as "good enough" in these performances?
- What portion of the cohort is meeting the standard?
- What reform efforts are underway or on the horizon?

These questions express the concerns that have motivated New Standards Partners to come together in an effort to link their state- and district-level assessments to a shared national standard: What is and is not working in other states? How much of what kind of work should we be requiring of our young people? What must the students in our state know and be able to do in order to take their places as citizens and workers? What does it mean to be educated at the turn of this second millennium?

To determine the content standards other nations use in mathematics, language arts, science, and other subject areas, the benchmarking process examines standards clearly expressed in national or regional curricula as well as standards that must be inferred from texts, syllabi, and class work. Materials collected and analyzed for content standards include national, regional, or school curricula; legislative or ministerial directives related to content; commonly used textbooks; exams; and examples of classwork. Teachers and other education professionals in each partner country review the research analysis at each step of data collection and interpretation to provide assistance in understanding official documents and to fill the gap between those documents and actual classroom practice.

Internationally benchmarking the New Standards assessment system includes comparing it with other assessment systems, where they exist, and otherwise with testing or examining practices. Materials collected and analyzed to understand the kinds of performances students around the world engage in to demonstrate competence are examples of external national exams (including information on when

they are given and for what purpose ) and examples of internal school or classroom exams and other evaluation activities. A professional review panel discusses and reviews these materials for understanding of the assessment system.

To determine benchmarks for "best in class" performances in schools around the world, New Standards collects scored student work on exams and classwork, scoring rubrics or guides, and teacher commentary on what the scores mean. Although this information is difficult to collect, New Standards believes that collections of work samples will be the cornerstone of genuine internationally competitive standards. New Standards will encourage research partners to collect and compile student work when possible. In some countries, New Standards may have to do this work, although compilation from outside the country is less desirable.

New Standards is committed to the ideal that all children in the United States can learn and that they can be held to higher standards of achievement. Benchmarks need to include information about what this ideal might mean in other countries; what portion of students are meeting the standards they have set? This information is gathered through data on pass/fail rates for national exams; where such data are not collected, the data result from professional estimates of percentages of students meeting the standards and percentages of students proceeding through various tracks, with clear descriptions of those tracks.

To benchmark not only to current practice but to education reforms underway or being planned, the following information is needed from each of the countries chosen for benchmarking: plans currently mandated by the ministry of education, either in the development or implementation stage; "best guesses" from university and research personnel; "best guesses" from university and research personnel regarding the direction of change; and research and development work conducted by companies developing texts and other curricular materials.

As American states are working with their districts to articulate both content and performance standards and to benchmark against internationally competitive mathematics achievement, the leading states are raising expectations for their own students. In an international environment as open to observation and communication as that of developed economies, we may expect that successful American efforts to improve student performance will draw as much attention from other nations as their efforts have hitherto drawn from us. This mutual interest sustains the collaborative mode of New Standards research and promises that benchmarking, undertaken to meet the needs of New Standards Partners in the United States, will remain international in scope.

***Timetable***

1994 The first mathematics reports will be published. (June)

1995 Revised mathematics reports will be published. (June)
The first language arts reports will be published. (June)

1996 Revised language arts reports will be published. (June)
The first science reports will be published. (June)

1997 Revised reports on science will be published. (June)

***Publications***

Reports on mathematics, language arts, and science will be published.

Setting standards across borders, OECD Network A summary volume. Lauren Resnick and Katherine Nolan.

***Database***

Possibilities for making New Standards Project benchmark activities materials available for public use are to be determined.

***Funding*** Funding is provided by The Pew Charitable Trusts and the John D. and Catherine T MacArthur Foundation, and by Partner contributions.

***Information Sources***

Lauren B. Resnick, Co-director
Learning Research Development Center
University of Pittsburgh
3939 O'Hara St., Rm. 824
Pittsburgh, Pennsylvania 15260
telephone: 412/ 624-7485
facsimile: 412/ 624-3051

Marc Tucker, Co-director
National Center on Education and the Economy
39 State Street, Suite 500
Rochester, New York 14612
telephone: 716/ 546-7620
facsimile: 716/ 546-3145

Katherine Nolan, Coordinator for International Benchmarking
Learning Research and Development Center
3939 O'Hara Street
Pittsburgh, Pennsylvania 15260
telephone: 412/ 624-8319
facsimile: 412/ 624-1470

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NOTE: This study summary was reviewed and edited by the office of Lauren Resnick at the Learning Research and Development Center in Pittsburgh in May 1994; Katherine Nolan provided database information on December 6, 1994.

## *PREPRIMARY PROJECT*

***International Organization*** International Association for the Evaluation of Educational Achievement

***Years of Data Collection*** Phase 1: 1989-91
Phase 2: 1991-93
Phase 3: 1994-96

***Purpose*** In countries throughout the world, demographic, social, and economic changes are driving an accelerating demand for early childhood services. At the same time, a growing body of research is demonstrating the long-term benefits of high-quality early childhood programs, thus increasing the general awareness of the importance of children's early years. These developments point to a need for sound and adequate information on which to base early childhood services. The IEA Preprimary Project is a response to the dearth of information about children's care and education experiences prior to formal schooling.

Some key questions inspired by current trends in early childhood care and education that have dictated the objectives and design of each phase of the Preprimary Project are as follows:

Phase 1:

- What kinds of early childhood care and education services do families use in various countries around the world?
- What are factors (socioeconomic, cultural) that influence parents' choice of early childhood care arrangements for their 4-year-old children?
- What are the characteristics of the early childhood care and education settings parents choose for their 4-year-olds?

Phase 2:

- What is the "quality of Life" for 4-year-old children in such settings as pre-schools, child care centers, and family day care homes?
- How do adults' educational values and expectations for 4-year-olds affect the way they (parents, teachers, caregivers) organize environments and activities for these children and the way they interact with these children?
- In any given nation, how does the "quality of life" for 4-year-old children in early childhood settings compare with that of 4-year-old children in early childhood settings in other nations?
- What is the relationship between children's developmental status and specific structural features and/or interactional processes of care/education settings?

Phase 3:

- What is the relationship between 4-year-old children's experiences in care/education settings and their later developmental status?
- What role might early childhood care and education play in preparing children for formal schooling?

The approach of the project has also been governed by methodological considerations about the study of young children and by the multi-disciplinary perspectives that guide public policy in the area of early childhood services. An additional consideration has been the relative lack of knowledge about preprimary service as compared with knowledge about services at other educational levels (elementary and secondary school).

To guide public policy formulation, each participating country's national study will provide timely information tailored to address that country's most salient issues and gaps in knowledge. In addition, the cross-national analyses will provide a valuable comparative baseline. By examining a greater range of variation in early childhood experiences than occurs within any one country, researchers will be able to test the cross-cultural generalizability of country-specific explanations of child development and early school achievement. The Preprimary Project is designed to extend scientific knowledge about early socialization and to provide data to evaluate early childhood models aimed at promoting the wellbeing of children.

***Organization and Management*** Fifteen IEA member countries have participated in one or more phases of the Preprimary Project. Each participating country has established a national research center, appointed a national research coordinator to supervise the study, and assembled additional staff to coordinate data collection and analysis. In its capacity as international coordinating center, the High/Scope Foundation has appointed a research team to provide general supervision of project activities and to provide technical assistance to participating countries. Dr. Leslie Kish, a noted expert in the field of international sampling, works cooperatively with the participating countries and the ICC staff to provide technical assistance with sampling issues.

The international coordinator, deputy international coordinator, and international project center are located at High/Scope. The international coordinator chairs the international project committee, which is comprised of those who put the study into operation (national research coordinators, international steering committee, and international coordinator). National research coordinators meet once a year, or sometimes more frequently.

***Design*** The three interrelated phases of the Preprimary Project are designed to:

- Identify and describe the types of early childhood care and education settings used by the families with 4-year-old children
- Describe the processes that occur within the context of various types of early childhood settings
- Look at the differential effects of these settings on children's later development.

***Participants***

Phase 1: Belgium (French), China (PRC), Germany (Federal Republic), Finland, Hong Kong, Italy, Nigeria, Portugal, Spain, Thailand, and the United States.

Phase 2: Belgium (French), China (PRC), Finland, Greece, Hong Kong, Indonesia, Ireland, Italy, Nigeria, Poland, Romania, Slovenia, Spain (Catalonia), Thailand, and the United States.

Phase 3: Same countries as in Phase 2. Follow-up of children at age 7, who were observed in Phase 2 at age 4.

*Sample*

Phase 1:

In each participating nation, researchers identified a probability sample of children 3 1/2 to 4 1/2 years old and interviewed their families using a household survey questionnaire. In most countries, multi-stage stratified cluster sampling procedures were used. The Phase 1 achieved sample sizes ranged from 424 in Belgium (Fr.) to 12,835 in China (PRC). In 7 of the 11 participating countries (China, Finland, Hong Kong, Italy, Nigeria, Thailand, United States), response rates were 80% or higher.

Phase 2:

The population of settings included the major types of settings used by families (as indicated by Phase 1 data or by other information sources) and settings of particular interest to policy makers. It was expected that each participating country would identify at least two major types of extra-familial settings for the study. In addition, whenever feasible, countries would include familial care as a type of setting (to include children receiving only this form of care).

To achieve levels of statistical power in data analyses commensurate with likely magnitudes of effects, researchers needed to include a sufficient number of settings. Preliminary considerations suggested that it would be sufficient to sample a minimum of 24 settings of each major extra-familial type, assuming that the total number of children attending each type of extra-familial settings sampled was at least 96. Within each setting selected, researchers randomly chose one or more children for inclusion in the study.

*Procedures and Summary of Content*

Phase 1: This phase was conducted between 1987 and 1991 and consisted of a household survey of families with 4-year-old children. Researchers in each of the 11 Phase 2 countries interviewed a representative sample of families. In doing so, they used the joint-national project directors-developed instrument, the Parent/Guardian Interview, which asked about the types of formal and informal care arrangements families use for their 4-year-olds.

Other information collected in the interview included the number of different settings attended by children, the reasons families use care/education services, the amount of time children spent in their various settings, family satisfaction with services, family background, and a detailed description of a typical day in the child's life. The design of Phase 1 allowed researchers to establish a typology of settings and to examine the patterns of use of various settings and to examine the patterns of use of various settings as they relate to a number of variables, such as urban/rural residence and family characteristics.

Funding to complete the Phase 1 data analysis and to prepare the final report were delayed and the timeline was revised by the steering committee and international coordinating center. The final report will be published in Fall 1994 jointly by Pergamon Press and the High/Scope Press.

Phase 2: This phase of the Preprimary Project is called the Quality of Life Study. It is an observation study that nationally and cross-nationally examines the characteristics of settings experienced by 4-year-old children and the relationship between the children's developmental status and their experiences in these settings. The 15 countries participating in Phase 2 observed the major settings identified in their national Phase 1 Preprimary Project.

Three key types of setting processes were addressed through on-site observations during Phase 2: adults' organization of the children's time, children's activities, and adults' behaviors. The children observed in each setting were assessed with respect to developmental criteria (language development, fine-motor coordination).

Along with the observation and assessment data, interviews and questionnaires were used to collect several other types of information, including: structural characteristics of settings (such as adult-child ratio, group size, management features, staff qualifications, and materials and equipment); family background data (such as socioeconomic information and household composition), and adult perceptions (such as educational values and expectations for children).

Phase 3: The third and final phase of the Preprimary Project is a follow-up study of the children observed at age 4. The 4-year-old children selected for observation and assessment in Phase 2 will be reassessed at age 7, the age when children from all participating countries will have completed at least a year of primary school. The evaluation at age 7 will draw on many sources to gather information about the children, including school records, interviews with teachers and parents, and assessment tests. Through the use of a wide variety of data sources, it will be possible to determine the effects of children's experiences in various settings during the preschool years.

Four general areas will be assessed in Phase 3:

- o child developmental status (including cognitive, language, social/emotional, and academic)
- o family background
- o teacher and classroom characteristics
- o national curriculum

Using measures and guidelines from national research coordinators, the international coordinating center has developed measures for each of the areas. Participating countries are pilot-testing these measures between January and June 1994 with final measures to be determined in Fall 1994.

*Data Collection and Analyses*

Phase 1: Researchers in each participating country used household survey procedures to gather data directly from families with preschool-aged children about their use of early childhood care and education services. The data were coded and sent to the international coordinating center where the cross-national data analyses were completed. The finding volume containing a wealth of descriptive information about the use of early childhood services in various countries is being published in Fall 1994.

Additional reporting activities included presentations at the 1990 annual meeting of the American Educational Research Association meeting and at the 1992 annual meeting of the National Association for the Education of Young Children.

Phase 2: Data collection consisted of the following components:

- o In each early childhood setting selected, observers used the 3 observation systems to collect data on two nonconsecutive mornings.
- o The teacher/caregiver in each selected setting completed a setting-information about their beliefs about the importance of specific areas of development for young children (expectations).

- Data collectors administered 2 to 5 Child Developmental Status measures to each child and administered a family background interview and a "beliefs" questionnaire to the parent/guardian of each child.

With the data obtained through observations, assessments, interviews, and questionnaires, researchers are evaluating the effects of different types of care settings on child development by exploring the relationships among the structural features of settings, the socialization processes occurring in settings, various features of the child's background, and the child's developmental status.

An early Phase 2 reporting activity was conducted at the 1989 annual meeting of the National Association for the Education of Young Children in a symposium co-sponsored with Organisation Modiale pour l'education Prescolaire (OMEP). The Phase 2 findings will be reported in a set of six monographs:

#1 Teacher/parent beliefs about children's development

#2 Provider survey findings presenting data bout the characteristics of group settings in various nations

#3 and #4
Observation system findings. Observation system findings will be the major results used to develop a new view of "quality" in early childhood programs, a view based on process characteristics such as adult/child interactions and adult involvement. The monographs will present findings about the amount of time children spend in different areas of learning, how adults interact with children, and who determines how children spend their time in early childhood settings. Findings will be available for various types of U.S. settings and for different types of settings in other nations, producing a very rich body of data for early childhood professionals and policy makers.

#5 Child assessment findings from each participating nation will be reported. In the United States, these findings will provide information related to the first of the six U.S. national educational goals, which states that "by the end of the decade all children in America will start school ready to learn." Phase 2 will provide information about the developmental status of children in many areas (cognitive, language, social competence) as they enter the formal educational system. With the study's design, researchers will be able to examine the relationship between children's developmental status and their preschool experiences, in the United States and in other countries.

#6 Causal models of the complete set of findings will present the major cross-national findings for Phase 2.

In connection with Phase 2, the High/Scope Foundation is preparing a set of 15 videotapes that illustrate the variety of early childhood settings encountered in various Phase 2 participating countries. Each of the 15 countries is represented by a 45-minute videotape that describes the care/education settings available to families and the nature of children's experiences in each setting. The set of tapes will show how facilities, materials, teaching styles, and program philosophies vary from setting to setting, and from country to country. They will reveal how political, socioeconomic, and cultural differences worldwide impact young children's development.

Phase 2 preliminary data were reported at the 1993 annual meeting of the National Association for the Education of Young Children. The international coordinator and international deputy coordinator presented preliminary findings about teacher and parent beliefs about important areas of development for 4-year-old children.

***Timetable***

1980 Researchers outlined ideas for an IEA study.

1982 The IEA General Assembly approved the planning group's draft proposal; an international project steering committee was appointed; an international coordinator and a coordinating center were selected.

1984 The international steering committee and international coordinating center completed the final proposal for the three-phase project; the General Assembly approved the proposal.

1987-1991: Phase 2

1989 The Preprimary Project co-sponsored a symposium at the NAEYC annual meeting.

1990 National research coordinators and the deputy international coordinator made presentations at the AERA annual meeting.
The international coordinating center and international steering committee presented Phase 2 (Quality of Life Study) and Phase 3 (Follow-up Study) workplan to the IEA General Assembly. (June)

1991 Phase 1 data collection was completed.
Phase 2 data collection was initiated.

1992 Phase 1 national data analyses were completed.
National project coordinators presented major Phase 1 findings at the NAEYC annual meeting.

1993 Phase 2 data collection was completed in 13 of 15 countries.
Phase 1 cross-national data analyses were completed.
Phase 3 measures were developed for pilot-testing.
Phase 2 reports timeline and contents were revised.
The international coordinator presented the Phase 2 report with policy implications and the Phase 3 proposal to the IEA General Assembly; the IEA General Assembly approved the Phase 3 proposal. (September)
Phase 2 findings were presented at the NAEYC annual meeting.

1994 The Phase 1 findings volume will be published by Pergamon Press and by High/Scope Press.
Phase 2 national and cross-national data analyses are being conducted.
Phase 2 Monograph #1 - teacher and parent beliefs about children's development will be published.
Phase 3 pilot-testing is being conducted.
Phase 3 data collection will begin.

1995 Phase 2 cross-national data analyses will be conducted.
Phase 2 Monograph #2 - group-setting characteristics will be published.

1996 Phase 2 Monographs #3 and #4 - observation system findings will be published.
Phase 2 Monograph #5 - child assessment findings will be published.
Phase 3 data collection will be completed.

1997 Phase 2 Monograph #6 - causal models of the complete set of findings will be published.

***Publications***

How Nations Serve Young Children: Profiles of Child Care and Education in 14 Countries. Ypsilanti, Michigan: High/Scope Press. (1989)

Families Speak: Early Childhood Care and Education in 11 Countries. Report of Phase 1 of the IEA Preprimary Project. Oxford: Pergamon Press and Ypsilanti, Michigan: High/Scope Press. (1994)

Phase 2 findings report will be published 1994-95.

Phase 2 Monograph #1 - Teacher/parent beliefs about children's development. (1994)

Phase 2 Monograph #2 - Provider survey findings. (1995)

Phase 2 Monographs #3 and #4 - Observation system findings. (1996)

Phase 2 Monograph #5 - Child assessment findings. (1996)

***Database***

***Name*** IEA Preprimary Project -- Phase 1

***Description*** Information about families' use of early childhood services collected using household survey procedures with nationally representative samples of families in 11 countries. Data include types of services used, reasons for using services, cost, problems, and satisfaction with services. A portion of each country's file contains a detailed description of a 24-hour period in the 4-year-old child's life, including where the child was and who was supervising the child. Finally, the data include family background information. (Countries: Belgium, China [PRC], Finland, Germany, Hong Kong, Italy, Nigeria, Portugal, Spain, Thailand, United States)

***To whom available*** To be determined.

***Restrictions*** To be determined.

***By what means available*** To be determined.

***Charge to user*** To be determined.

***When available*** January 1995 (Phase 1 of the 3-phase IEA Preprimary Project is completed. As the IEA international coordinating center for this project, High/Scope has prepared the database for Phase 1, and will send a copy of the database to IEA headquarters, where it will become part of the overall set of IEA databases.)

***For further information about access to this database, contact:***

Patricia P. Olmsted
High/Scope Educational Research Foundation
600 North River Street
Ypsilanti, Michigan 48198
telephone: 313/ 485-2000
facsimile: 313/ 485-0704
electronic mail: PAT_OLMSTED@UM.CC.UMICH.EDU

***Funding*** Each participating country is responsible for locating the funds and other resources necessary to conduct the Preprimary Project nationally. Support to the international coordinating center has been provided by government agencies (U.S. Department of Health and Human Services, U.S. Department of Education), the National Academy of Sciences, and foundations (Carnegie Corporation, High/Scope Foundation, Packard Foundation, Pew Charitable Trust, Spencer Foundation).

***Information Sources***

Dr. David P. Weikart, International Coordinator and International Project Committee Chair
High/Scope Educational Research Foundation
600 North River Street
Ypsilanti, Michigan 48198-2898
telephone: 313/ 485-2000
facsimile: 313/ 485-0704

Dr. Patricia P. Olmsted, International Deputy Coordinator
High/Scope Educational Research Foundation
600 North River Street
Ypsilanti, Michigan 48198-2898
telephone: 313/ 485-2000
facsimile: 313/ 485-0704
e-mail: Pat_Olmsted@UM.CC.UMICH.EDU

International Association for the Evaluation of Educational Achievement Secretariat
c/o SVO
Sweelinckplein 14
2517 GK The Hague THE NETHERLANDS
telephone: 31-70-346-96-79
facsimile: 31-70-360-99-51
e-mail: iea@svo.nl

Gordon M. Ambach, U.S. Liaison to IEA
Council of Chief State School Officers
One Massachusetts Ave., N.W., Suite 700
Washington, D.C. 20001-1431
telephone: 202/ 408-5505
facsimile: 202/ 408-8076
e-mail: gambach@nas.edu

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NOTE: This study summary was reviewed and edited by Patricia Olmsted at the High/Scope Educational Research Foundation in Ypsilanti, Michigan on June 24, 1994; Olmsted provided database information on December 1, 1994.

## *READING LITERACY STUDY*

***International Organization*** International Association for the Evaluation of Educational Achievement

***Years of Data Collection*** 1990 - 1991

***Purpose*** Because policy issues are of paramount importance for many of the educational leaders who support the IEA international studies, the Reading Literacy Study was designed to provide results that could serve as a basis for decisionmaking concerning the improvement of reading in primary and secondary schools. The study coincided with the UNESCO World Literacy Year and set 1990 as the year in which the first large-scale baseline data were established against which future achievements in literacy would be measured. This international study was designed to develop instruments for measuring literacy in each of the 32 participating country school systems. It was expected to establish a clear unified definition of literacy and to measure the comparative ability of educational systems to teach literacy skills.

For this study, reading literacy refers to the linguistic and cognitive processing of written language forms required by society and/or valued by the individual. As this implies, literacy is regarded as both a cultural practice and an intellectual achievement. For purposes of the study, literacy is defined as the "ability to understand and use those written language forms required by society and/or valued by the individual." This definition has been operationalized in terms of reading test items along three scales (narrative, expository, and document) that correspond to text types.

The purposes of the IEA Reading Literacy Study are to:

- Describe the achievement levels in reading literacy of comparative samples of students in education systems
- Describe the voluntary reading activities of 9 and 14 year-old-students
- Identify differences in policies and instructional practices in reading, and study the ways in which they relate to students' achievement and voluntary reading
- Produce valid international tests and questionnaires that could be used to investigate reading literacy development in other countries
- Provide national baseline data suitable for monitoring changes in literacy levels and patterns over time.

The products of the international study are:

- valid measures suitable for measuring literacy across countries
- estimates of the percentage of each population reaching specified levels of literacy
- comparative data across countries of literacy achievement in three domains (narrative passages, expository passages, documents) on an international scale
- identification of which school, teacher, and societal factors influence literacy and to what extent
- comparative data across countries on school and teacher practices in the teaching of reading
- establishment of a 1990 baseline database in 30 countries

These products provide each education system with data on literacy levels that can be related to economic, health, and other educational indicators. (The study identified variables that, if changed,

could help to improve literacy rates.) On an international level, the large 1990 database will be useful in the future for assessing changes in literacy achievement over time.

Because the United States has large national and state data collection efforts underway, the U.S. national steering committee for the IEA Reading Literacy Study considers the primary purpose of participating in this study to be the gathering of comparative international data and information that will not only compare student competence but provide insights to help explain differences in performance by U.S. students and other students.

The IEA Reading Literacy Study provides an opportunity to investigate how reading is taught in a large number of education systems with wide variations in traditions, economic development, school organization, classroom conditions, teacher characteristics, and orthography, and to contribute to a more context-sensitive perspective on successful means of teaching reading and successful reading acquisition. Because there is much unity in the culture of reading instruction around the world, texts have many universal features in their functions, contents, structures, and textual characteristics. This unity makes it possible to translate texts. The Reading Literacy Study assumes that there is a common basis that makes international comparison possible.

***Organization and Management*** IEA selected an international coordinator, established an international coordinating center and data processing center at the University of Hamburg in Germany, and appointed a steering committee and technical advisor. The members of the steering committee, the international coordinator, and the data manager worked together with the national research coordinators who were responsible for the conduct of the project in their respective countries.

The national center in each participating country appointed a national research coordinator to assume overall responsibility for the project within that country and a national committee composed primarily of reading literacy experts. National centers that wished to attach additional research to the project appointed appropriate additional members to their national committees. National centers appointed staff as required.

All conceptual and operational decisions were made cooperatively by the steering committee and national research coordinators. The international sampling referee approved and checked sampling plans. A data processing team at the University of Hamburg created the computer-stored working files.

The U.S. national center and national research coordinator are both located at the National Center for Education Statistics. As subcontractors, Westat, Data Recognition Corporation, and the Council of Chief State School Officers have worked with the NCES to conduct the testing, analysis, and reporting for the United States. The U.S. national center (NCES) has provided technical assistance to other participating country national centers, through two seminars. In the seminars national research coordinators, international coordinating center staff, NCES representatives, and Westat staff worked together to generate appropriate descriptive tables reflecting the core concerns of the international Reading Literacy Study. At the conclusion of each seminar, participants had the basis for a national report in the form of a set of tabulations around which such a report could be built.

## *Design*

### *Participants*

Research institutes from thirty-two systems of education participated in the study. Twenty-seven countries participated in testing populations A and B: Belgium (French), Canada (British Columbia), Cyprus, Denmark, Finland, France, Germany (East), Germany (West), Greece, Hong Kong, Hungary, Iceland, Ireland, Italy, The Netherlands, New Zealand, Norway, Portugal, Singapore, Slovenia, Spain, Sweden, Switzerland, Thailand, Trinidad & Tobago, the United States, and Venezuela. One country participated only in Population A: Indonesia; four countries participated only in Population B: Botswana, Nigeria, the Philippines, and Zimbabwe.

Population A was defined as: all students attending mainstream schools on a full-time basis at the grade level in which most students aged 9:00-9:11 years were enrolled during the first week of the eighth month of the school year. Population B was defined as: all students attending mainstream schools on a full-time basis at the grade level in which most students aged 14:00-14:11 years were enrolled during the first week of the eighth months of the school year.

***Sample*** The formal survey was conducted on scientifically selected national samples of 9- and 14-year-olds, typically 1,500 to 3,000 pupils per country and their teachers. To obtain comparable samples of students, multi-stage sampling was used in each country and schools or classes were typically drawn with a probability proportional to the size of the school or class. Where schools were drawn, an intact class was selected at random within each school, but in Population B some national research coordinators selected students at random from all classes in the grade level in the school. To overcome fluctuations in the execution of the sampling, weighting was used to adjust for any variations in the probability of selecting students. These sampling weights were used in all data analyses.

The U.S. sample included 332 participating schools. The target population is similar to that of the National Assessment of Educational Progress in that it uses the most inclusive population possible. However, unlike NAEP, IEA Reading Literacy targeted all students in the modal grades for 9- and 14-year-olds. This differs from the NAEP target, because IEA Reading Literacy tested intact classes and 14- rather than 13-year-olds.

### *Procedures and Summary of Content*

Reading Test: The Reading Literacy Study reading test included passages and items representing narrative text, expository text, and documents. The tasks required an ability to comprehend specific vocabulary and continuous text and to locate and use document information.

Background Questionnaires: The student questionnaire was designed to obtain information on the students' home and school circumstances, and included questions concerning parents' education and interaction with the student and his schooling, the students' reading and leisure time activities, and personal descriptive data. The teacher questionnaire was designed to obtain information on each teacher's background, instructional practices, and beliefs, and included questions concerning training and experience, personal descriptive data, classroom materials and environment, and teaching strategies and activities. The school questionnaire was designed to obtain information about the school circumstances and policies as viewed by the principal, and included questions concerning the principals' training and experience, personal descriptive data, and school descriptive data.

National Case Study Questionnaire: The national case study questionnaires were designed to obtain information on national policy, enrollment patterns, and economic conditions and included questions on curriculum, age of entry to school, teachers' salaries, hours of instruction, percentage of an age group enrolled in formal schooling, and teacher training emphasis. National research coordinators completed these questionnaires.

***Data Collection and Analyses*** All students took reading tests and responded to a background questionnaire about their reading at home and at school. Teachers and school principals responded to questionnaires about themselves, their teaching, and the school organization. Each national center completed a national case study questionnaire. Constructs were identified as the basis of the international data analysis. The major analysis was performed for Population A.

In December 1991 the U.S. national steering committee presented a symposium at the National Reading Conference meeting in Palm Springs, California. This was the first presentation of the U.S. data with regard to reading test design, family characteristics, differences in scaling, teacher characteristics, and principals as instructional leaders.

Four reports of preliminary international results were published in 1992-1993; the main international research report was published in 1994. The IEA Reading Literacy Study international database was established in 1993. A full study archive for the study was established in 1994. The archive includes the conceptual framework; test items as submitted and revised; test item selection criteria, national test instruments and case study questionnaires; national sample designs; final versions of reading tests and questionnaires, manuals, codebooks, and datasets; and national and international reports and publications.

Three U.S. national reports will be published in 1994. The first is more technical in nature and covers the procedures used in gathering and processing the data for the U.S. portion of the international study; it also explores issues of validity, comparisons to the National Assessment of Educational Progress, the relationship of the Reading Literacy Study to the research literature, and modeling techniques used in developing the U.S. analyses. The second U.S. national report is intended for a more broad general audience. The third consists of papers that deal with issues in comparative studies. A fourth report will focus on the United States in international perspective and include special analyses of modeling, bilingual instructional programs, quality of school life, and instructional practices.

***Timetable***

1986 The IEA General Assembly approved the Reading Literacy Study and formed a steering committee and technical advisory group.

1988 The international coordinating center was established and the international coordinator was selected, both located at the University of Hamburg.
Participating country research institutes appointed national research coordinators.
National research coordinators met. (November)

1989 The international steering committee met in San Francisco to review and revise test items. (April)
National research coordinators met in Washington to agree on field test items and procedures and to approve sampling plans. (June)
The international steering committee met with national research coordinators. (November)
The U.S. national advisory panel was formed; it met in December.

1988-1990
Items for the tests and questionnaires were generated, translated, and pilot tested. (November 1988-July 1990)

1990 The U.S. national steering committee met in Boston.
The international steering committee met in Hamburg. (May)
The international steering committee and national research coordinators met in Frascati, Italy to reach agreement on final instruments and study design. Final tests were selected. (July)
A baseline database was established in 30 countries.

1990-1991
The formal survey was conducted. (October 1990-April 1991, depending on the school year in each country)

1991 The international steering committee held a technical advisory committee meeting. (April)
The U.S. national steering committee met to review the U.S. national data and plan for analysis and reporting. (June)
The international steering committee held a national research coordinators meeting in Denmark. (October)
The U.S. national steering committee presented a symposium at the National Reading Conference in Palm Springs, California. (December)

1992 National research coordinators met in Madrid. (October)

1992-1994
Preliminary results were published in four books.

1993 The international coordinating center completed its work and transferred data tapes and other materials to IEA headquarters.
An international database was established.

1994 A full study archive was established.
The main research report was published.
Four U.S. national reports will be published.

***Publications***

How in the World Do Students Read? Preliminary results. IEA, The Hague, The Netherlands. (1992)
Effective Schools in Reading: Implications for Educational Planners (An Exploratory Study). Preliminary results. IEA, The Hague, The Netherlands. (1992)

Teaching Reading Around the World. Preliminary results. IEA, The Hague, The Netherlands. (1993)
Gender Differences in Reading. Preliminary results. IEA, The Hague, The Netherlands. (1994)
International Report: The IEA Study of Literature: Achievement and Instruction in Thirty-two School Systems. Oxford: Pergamon Press. (1993)
The IEA Reading Literacy Study: Technical Report. IEA, The Hague, The Netherlands. (1993)
Main research report. Oxford: Pergamon Press. (1994)
U.S. national reports will be published in 1994.

***Database***

The IEA Reading Literacy Study international database was established in 1993.

***Funding*** International funding was provided by The MacArthur Foundation, The Maxwell Family Foundation, The Melon Foundation, the National Center for Education Statistics (through the National Academy of Sciences), Commission of the European Communities, UNESCO, and annual contributions from participating countries. Participating country research institutions also provided funds for their national costs of conducting the study and for travel and subsistence costs for their national research coordinators to attend national research coordinator meetings.

***Information Sources***

Marilyn Binkley, National Research Coordinator
National Center for Education Statistics
555 New Jersey Ave., N.W.
Washington, D.C. 20208
telephone: 202/ 219-2195
facsimile: 202/ 219-1736
e-mail: bmt@cu.nih.gov

International Association for the Evaluation
of Educational Achievement Secretariat
c/o SVO
Sweelinckplein 14
2517 GK The Hague THE NETHERLANDS
telephone: 31-70-346-96-79
facsimile: 31-70-360-99-51
e-mail: iea@svo.nl

Gordon M. Ambach, U.S. Liaison to IEA
Council of Chief State School Officers
One Massachusetts Ave., N.W., Suite 700
Washington, D.C. 20001-1431
telephone: 202/ 408=5505
facsimile: 202/ 408-8076
e-mail: gambach@nas.edu

Binkley, Marilyn R.

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International Association for the Evaluation of Educational Achievement

1993 Activities, Institutions, and People: IEA Guidebook 1993-1994. IEA, The Hague, The Netherlands.

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NOTE: This study summary was reviewed and edited by Marilyn Binkley at the National Center for Education Statistics in Washington, D.C. on June 22, 1994.

## *STUDY ON PERFORMANCE STANDARDS IN EDUCATION*

***International Organization*** U.S. Department of Education, Office of the Under Secretary and the Organisation for Economic Co-operation and Development

***Years of Data Collection*** 1994

***Purpose*** Through the Goals 2000 education reform legislation, the federal government is supporting state efforts to develop or adopt content and performance standards for their school children; it also establishes a National Educational Standards and Improvement Assessment Council to certify state-submitted standards and assessments. Legislation reauthorizing the largest federal elementary and secondary education programs requires as a condition of federal funding that U.S. states submit state plans describing coherent and challenging content and performance standards that they will establish or use for all children, as well as what the states will do to enable children to meet these standards.

Because the potential influence of such standards is so great, and because the complexity of implementing them in our diverse educational systems is so challenging, U.S. policy makers seek to learn through cooperation with other countries that already have substantial experience in developing and implementing education standards, particularly the members of the Organisation for Economic Co-operation and Development. In order for this international experience to have an impact on the standards being developed in the United States, it must be compiled, analyzed, and disseminated before subject-area standards are finalized and disseminated in the United States.

In order to obtain the required information and analyses on education standards in other countries, the U.S. Department has contracted an agreement with the Organisation for Economic Co-operation and Development. In carrying out this agreement, a series of approximately eleven discrete analytical reports will address the question: What can the United States learn through interaction with member countries of the OECD about how to set and implement subject-matter standards (especially performance standards)?

Through this study the OECD is developing the following products:

- A series of approximately eleven brief written analyses (ten country specific and one cross-national) resulting from the analyses on education standards.
- An annotated compilation of standards-based assessment materials from selected OECD countries (as appropriate, these may be in the form of appendices to the country specific or cross-national written analyses).
- Brief written records of meetings between officials and educators from the participating countries and the OECD.

***Organization and Management*** In accordance with OECD work underway in 1993 on school effectiveness, the OECD is responsible for the following for this study: coordinating the work of obtaining the required information and analyses on education standards; providing its expertise, staff, and consultant time to link expert researchers and policy makers from OECD countries with their counterparts in the United States; and contracting with expert consultants to conduct the analyses on education standards, and carry out other specific analyses.

The U.S. Department of Education Office of the Undersecretary is responsible for funding the OECD for its activities for this study; designating a project officer to serve as a single point of contact for liaison with the OECD; reviewing, providing comments, and approving all statements of work, proposed consultants, draft reports, and schedules for completion of specific subtasks; and consulting and coordinating with other offices within the Department of Education and other federal government agencies that have significant ongoing activities in the area of education standards (for example, the Office of Educational Research and Improvement and the National Academy of Sciences).

***Design***

***Participants***

Australia, Canada (Ontario), England and Scotland, France, Germany, Ireland, Japan, Spain, Sweden, and the United States

***Sample***

Not applicable.

***Procedures and Summary of Content*** Country studies: Written essays may emphasize distinctive features in a country's system and whether the writer considers them as strengths or weaknesses. They will address:

- reasons for concern about standards
- differences in student achievement
- setting and monitoring standards
- procedures and methods (who sets the standards; how are they managed and financed, how are consistency and fairness achieved, what factors influence standard levels, what are the mechanics of the standards setting process, what constitutes a performance standard? how are performance standards applied, how and when are standards reviewed, how is attainment of performance standards determined, how are instruments constructed and scored, how are attainment and analyses reported, and are there provisions for testing and scoring children with special needs?)
- preconditions and problems
- policy formulation and decision-making
- the international dimension (what is the value of comparing procedures in OECD member countries for setting performance standards?)

***Data Collection and Analyses*** Analytical activities being used are:

1. Country-specific technical studies of the development and implementation of subject-area standards and standards-based assessments, with special emphasis on performance standards (i.e., the levels at which students are expected to perform). The specific countries being analyzed were selected by mutual agreement of the OECD, the U.S. Department of Education, and the countries themselves. The studies are based on interviews and discussions with relevant officials and analyses of primary and secondary data sources.

Of particular interest in designing and carrying out these studies are:

- o the policies, procedures, criteria, and threshold(s) set for passage and how and by whom they are determined;
- o techniques of mediation of scores or ratings, arbitration and review procedures, and the outcomes of these techniques;
- o procedures for students to meet the standards;
- o the use, methodology, and success of "performance-based assessment;"
- o whether and how performance standards are or have been used in OECD countries to assess educational institutions and local-government education agencies, for purposes of continuous improvement and accountability.

2. Comparative studies that synthesize and analyze the information gathered under the country-specific work carried out under the country-specific technical studies.

***Timetable***

1994 Country reports will be in final draft. (Fall)
Synthesis paper will be prepared. (Fall)

***Publications***

To be determined.

***Database*** No data base is available to the public at this time.

***Funding*** Funding is provided by the U.S. Department of Education.

***Information Sources***

Marshall S. Smith, Undersecretary
U.S. Department of Education
400 Maryland avenue, S.W., Room 3127
Washington, D.C. 20202
telephone: 202/ 401-3132
facsimile: 202/ 401-3036

R.A. Cornell, Deputy Secretary General
Organisation for Economic Co-operation and Development
2, rue Andre-Pascal
75775 Paris Cedex 16 FRANCE
telephone: 33-1-45-24-82-00
facsimile: 33-1-45-24-85-00

U.S. Department of Education and Organisation for Economic Co-operation and Development
1993 Agreement Between the U.S. Department of Education Office of the Undersecretary and The Organisation for Economic Co-operation and Development. U.S. Department of Education, Washington, D.C. and OECD, Paris, France.
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NOTE: This study summary was reviewed and edited by Lenore Garcia at the U.S. Department of Education Office of Planning Services in Washington, D.C. on June 8, 1994; Lenore Garcia provided database information on February 17, 1995.

## *SURVEY OF MATHEMATICS AND SCIENCE OPPORTUNITIES (SMSO)*

***International Organization*** Michigan State University

***Years of Data Collection*** 1991-1992
1992-1993

***Purpose*** The purpose of the Survey of Mathematics and Science Opportunities is to develop better opportunity-to-learn methodology for the IEA Third International Mathematics and Science Study and to characterize the educational opportunities for learning mathematics and science in SMSO participating countries. This survey is a research and development effort studying intended curriculum, opportunity to learn, classroom processes in mathematics and science instruction, and teachers' knowledge of mathematics and science; it will provide conceptual, empirical, and instrumentational input for TIMSS. The SMSO survey will enable TIMSS to provide better characterizations of achievement level differences among and within countries and to explain the curricular context from which these differences arise.

***Organization and Management*** The SMSO project and project director are located at the Michigan State University College of Education. The project director works with a team of specialists and an advisory board of internationally known experts.

***Design*** To develop measurement of intended curriculum, opportunity to learn, classroom processes, and teachers' knowledge of mathematics and science, and to provide a characterization of mathematical and science opportunities in each participating SMSO country, the following were used:

- Analysis of curricular materials and development of a curriculum framework onto which the intended curriculum of a country could be mapped. These are multi-aspect frameworks that include a content domain, performance expectations, and context. The curriculum framework was then applied to a set of curriculum syllabi and revised as necessary.

- Classroom-based study in each of the SMSO participating countries. As separate aspects of the classroom studies, the development of improved measures of subject matter-specific pedagogy, teacher knowledge, and opportunity to learn were combined.

***Participants***

France, Japan, Norway, Spain, Switzerland, and the United States

***Sample*** The materials prepared to measure subject matter specific pedagogy, teacher knowledge, and opportunity to learn were used in a nationally generated sample of 20-30 classrooms within each of the participating countries for a full school year.

***Procedures and Summary of Content*** Logs, case studies, and other instruments were used in the selected classrooms. Trained interviewers visited the schools every other week to collect logs and other materials responded to by teachers. Teachers were also interviewed and classroom observations of mathematics and science lessons were conducted.

***Data Collection and Analyses*** During 1992-93 the focus was on self report measures validated in the case studies. Analysis of the data was initiated with a meeting of representatives from each participating country. Representatives compiled the data, documented any irregularities in the data collection procedures, and established data analysis plans.

SMSO has developed curriculum frameworks for mathematics and science. The frameworks are systems for coding and describing materials such as curriculum guides, syllabi, textbooks, and examinations along each of several dimensions and with regard to multiple attributes. SMSO has contributed to TIMSS by developing various teacher and school questionnaires, the TIMSS Conceptual Framework for Contextual Questions, the TIMSS Mathematics and Science Curriculum Frameworks, the TIMSS Document Analysis Manual, and the TIMSS Topic Trace Mapping Instructions and Forms.

Six countries have participated in the development of a conceptual model of educational opportunity and in the development and piloting of related questionnaires and procedures in preparation for TIMSS. During 1991-92 observations were made in multiple classrooms in France, Japan, Norway, Spain, Switzerland, and the United States. Discussions of these observations served to inform questionnaire development for TIMSS.

The Opportunity to Learn pilot was conducted in over 75 classrooms in France, Japan, Spain, Switzerland, and the United States. It gathered information from teachers and students on students' opportunity to learn various topics as represented in the TIMSS curriculum frameworks. This pilot was designed to address issues of validation of teachers' indications of students' opportunity to learn, which can provide a rich and valuable context for understanding students' performance on achievement assessment measures.

A report on what SMSO research has learned was presented at a symposium at the American Educational Research Association annual meeting in Atlanta.

In January 1994 representatives from the six SMSO countries held an international working meeting, focusing on classroom observations of teachers' instructional practices. Participants read, discussed, and analyzed summaries of over 100 classroom observations that had been conducted in the SMSO countries. Analyses of these observational data summaries will be presented in a book on instructional practices.

***Timetable***

1991 Development of curriculum frameworks began.
A taxonomy of frameworks was drafted and used in trial coding.
Development of methodology and instruments for classroom studies began.
Data was reviewed and taxonomy revised.
A protocol manual was developed.

1992 The full-scale study was conducted.
Curricular materials data were analyzed.
Curricular materials report was written.
A trial of test items was conducted using students in classroom study.
U.S. data was coded.
Data from SMSO countries was banked, cleaned, and analyzed.
A final instrumentation recommendation was made to TIMSS.

1992-1993

Classroom observations were made in the 6 SMSO countries.

1992 Three international meetings were held to discuss classroom observation information.

1993 A report on what SMSO research has learned was presented at a symposium at the AERA annual meeting in Atlanta. (April)
A meeting was held to produce versions of the student, school, and teacher questionnaires for international piloting. (May)
Final pilot forms were submitted to the TIMSS international coordinating center.
Final pilot forms were used in the October teacher and school questionnaire pilot.
International meeting was held, to discuss plans for further data analyses and publications. (fall)
Data collection for the Opportunity to Learn pilot was completed.

1994 Representatives from the six SMSO countries held an international working meeting, focusing on classroom observations of teachers' instructional practices. Paris. (January)
A revised version of the student questionnaire was used in the March international field trial.
Two major SMSO papers were published by the TIMSS international coordinating center
Representatives from the six SMSO countries held an international working meeting, to complete analyses for the Opportunity to Learn pilot and discuss drafts of the Instructional Practices book. (summer)
The Instructional Practices book will be completed by the end of 1994.
Two SMSO papers were published by the TIMSS international coordinating center.

***Publications***

Two major SMSO papers have been issued as IEA Third International Mathematics and Science Study international coordinating center publications:

Test Blueprints: A Description of the TIMSS Achievement Test Content Design. University of British Columbia, Vancouver, Canada. (1994)

TIMSS Educational Opportunity Model: Detailed Instrumentation And Indices Development. University of British Columbia, Vancouver, Canada. (1994)

The SMSO Research Report Series includes 57 draft and final documents on topics such as mathematics, science, and opportunity-to-learn curriculum framework, and topic trace mapping. It also includes questionnaires and manuals.

Three proposed SMSO survey reports are:

Instructional practices: An international report of differences across 6 countries (Japan, France, Norway, Switzerland, Spain, United States) in the delivery of classroom instruction

Opportunity-to-learn achievement study: The report of a study of opportunity to learn -- how it is measured, its validity, and its reliability

Qualitative textbook analyses: A qualitative description of mathematics textbooks in the six SMSO countries

***Database***

At this time the information that has been gathered for the SMSO/Third International Mathematics and Science Study is not public information. It will be a year or two before this information can be released.

***Funding*** Funding is provided by the National Science Foundation in conjunction with the National Center for Education Statistics.

***Information Sources***

William H. Schmidt, Project Director
463 Erickson Hall
Michigan State University College of Education
East Lansing, Michigan 48824-1034
telephone: 517/ 353-7755
facsimile: 517/ 432-1727
e-mail: wschmidt@msu.edu

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NOTE: This study summary was reviewed and edited by William Schmidt at Michigan State University in East Lansing on July 10, 1994; database information was provided by Schmidt on November 29, 1994.

## *THIRD INTERNATIONAL MATHEMATICS AND SCIENCE STUDY (TIMSS)*

***International Organization*** International Association for the Evaluation of Educational Achievement

***Years of Data Collection*** 1993-1995
1997-2000

***Purpose*** The Third International Mathematics and Science Study will be a major source of information for discussion of the quality of education around the world. It will not only measure student achievement in mathematics and science internationally, but will also investigate differences in curriculum and instruction, and include alternative assessment options.

Policy makers are increasingly called upon to make decisions affecting the quality of education in their nations. The quality of the educational systems of a nation is seen to be linked to the ability of a nation to compete in the international marketplace. Therefore, increasingly policy decisions for education are being examined in light of the economic status of a nation and policy makers are looking to the results of international studies as a source of information. During this time of rapid and pervasive technological advancement, their interest is particularly focused on the areas of mathematics and science achievement that are seen to be strongly linked with economic development.

TIMSS will simultaneously investigate science and mathematics curricula and achievement. This design will enable researchers to collect data on two different subjects concurrently and will enable educators and policy makers to identify relationships between the two disciplines as they are intended for learning, as they are taught, and as they are learned.

Previous IEA studies in the areas of mathematics and science have produced valuable insights into a number of aspects of the teaching and learning process. In addition, they have provided a number of important lessons with respect to the design and conduct of large-scale international research projects in education. TIMSS will build on this foundation, and will provide further information about several important matters, such as:

- The need to provide current national and international information that educational systems can use to compare and contrast their curricula, teaching practices, and student outcomes with the educational systems from other countries of interest.

- An assessment of the potential impact that alternative curricular offerings, teaching strategies, and administrative arrangements have on learning.

- An identification of what is possible in the teaching of mathematics and science. For example, results from the Second International Mathematics Study showed extremely high growth rates in two countries, and that finding indicates that more significant growth rates might be possible in other countries. Identification of the underlying causes of those high growth rates would have profound educational implications.

- A greater understanding of how and why student attitudes change, and what relationship the development of positive attitudes bears to classroom practices. Such an understanding is crucial to the development of a more complete picture of how science and mathematics learning takes place.

Educational inputs, processes, and outputs constitute three basic components of the educational system, and each of these is related to the others in a complex, integrated whole. An important objective of TIMSS is to examine the comparative influence of a variety of constituent variables within each component on the success of a given educational system as indicated by measures of student achievement, participation, attitudes, and aspirations.

IEA has established a cycle of studies covering the major areas of the school curriculum: the 1990s will be the TIMSS decade. It has been more than 10 years since the IEA Second International Mathematics Study and Second International Science Study were conducted (although publication of most of the international reports from those studies was delayed because of lack of funding needed to carry out the analyses of the international data). In the interim, interest in cross-national comparisons generally, and in the areas of science and mathematics specifically, has increased dramatically.

Mathematics and science are important components of the school curriculum in every country. They are seen as integral components of every student's educational program. As the role and impact of technology continue to increase in society and in the workplace, the concepts, processes, and skills of science and mathematics are likely to become even more highly valued and the importance of these subjects in school curricula to become even greater.

Many countries around the world are currently involved in major reforms of their curricula in mathematics and science, and many of them will look to IEA and to TIMSS for the kind of information they need to guide that process. The findings from TIMSS will be of great interest internationally to educators, curriculum developers, researchers, policy makers, and politicians.

Some of the major topics on which TIMSS will report are:

- Mathematics and science curricula. The results of the curriculum analysis will document international variation in mathematics and science curricula.
- Opportunity to learn. Opportunity-to-learn data, in conjunction with the curriculum analysis, will illustrate what is possible in the teaching of science and mathematics.
- Students' achievement. TIMSS will give considerable emphasis to students' achievement, including students' ability to apply their knowledge and skills in non-routine settings.
- Use of technology. The role of technology in the teaching and learning of mathematics and science, particularly as regards the use of calculators and computers for instructional purposes, is a topic of significant interest for TIMSS.
- Participation rates. The participation of students in pre-university courses in mathematics and science will be examined, particularly with regard to gender-based differences.
- Tracking and streaming. There is a considerable amount of international interest in the kinds of practices employed by schools and school systems to direct students' course selection, including tracking and streaming. Information about such practices will be collected at several levels within each participating system.
- The role of textbooks. An investigation of the nature, role, and influence of officially prescribed textbooks on the teaching of mathematics and science is one of the main goals of the curriculum analysis component of TIMSS.
- Instructional practices. A comparison of instructional practices, based on teacher self-report data, will be a major aspect of the study.

The data from this rich array of cross-national comparisons of a large number of widely different countries should contribute significantly to the unfolding research agenda and to the needs of policy makers, researchers, and educators in many countries.

***Organization and Management*** The International Association for the Evaluation of Educational Achievement (IEA) has a chair and a board of directors. The IEA Secretariat coordinates all ongoing studies. Individual projects have their own international coordination centers responsible for carrying out a given study, and these are backed by an international steering committee and the IEA international headquarters. The international steering committee chair is located at the Ontario Institute for Studies in Education in Toronto, Canada.

The International Association for the Evaluation of Educational Achievement (IEA) headquarters is located in The Hague in The Netherlands. The International Coordinating Center for TIMSS is located in the University of British Columbia Department of Mathematics and Science Education in Vancouver, Canada. The International Coordinator is now assisted by a Deputy International Coordinator who has a major administrative responsibility for all aspects of the study. As TIMSS coordination has decentralized, a range of study activities has been contracted to institutions in several countries around the world.

The 1993 IEA General Assembly confirmed the new position of Study Director for TIMSS. The Study Director and Study Center are located at Boston College. The study director has overall direction of all study activities, including those that the International Coordinating Center continues to manage. A National Research Coordinator in each participating country is responsible for the conduct of the TIMSS study in that country. (The IEA General Assembly approved a motion to discontinue the use of the term National Project Coordinator, and to replace it with National Research Coordinator, which has been used in previous IEA studies.)

Data processing for the pilot study is being conducted at the Institute of Comparative Education at The University of Hamburg in Germany; data analysis for the pilot study is being conducted in Australia at the Australian Council for Educational Research; questionnaires are being developed at Michigan State University in East Lansing, Michigan; performance assessment tasks and scoring rubrics are being developed at the National Foundation for Educational Research in England.

The study will draw upon the expertise accumulated across the IEA community during the past thirty years of IEA's existence. The roles of the International Coordinating Center and Study Director are to coordinate the development of timelines, instruments, sampling procedures, data entry procedures, analysis methods, translation verification systems, and reports from the data supplied by the participating educational systems. To insure the integrity of the study, national centers for the participating educational systems will use standardized procedures and systems developed by the International Coordinating Center and Study Director.

The U.S. National Research Center and National Research Coordinator are located at Michigan State University College of Education in East Lansing, Michigan. U.S. TIMSS data collection is being conducted by Westat as contractor to the National Center for Education Statistics. The Westat contract also involves several subcontractors: Educational Testing Service, National Computer Systems, Harold W. Stevenson of the University of Michigan, and James W. Stigler of the University of California at Los Angeles. Each subcontractor operates a specific portion of the contract under the overall direction of Westat. A TIMSS Project Officer at the National Center for Education Statistics is the government project officer for all contractor activities.

Westat is responsible for U.S. TIMSS production of questionnaires and assessments and for receipt and processing of completed instruments for the spring 1994 field test and spring 1995 main data collections. Westat will receive support from National Computer Systems in these activities. Educational Testing Service will also assist by reviewing instruments and materials and collaborating with Westat in data analysis activities.

U.S. states who desire to compare the achievement of their students to that of other nations participating in TIMSS have an opportunity to contract with Westat to participate as a "mini-nation" in the TIMSS data collection.

U.S. TIMSS case study activities will be directed by Harold Stevenson; videotape observation project will be directed by James Stigler.

***Design*** The design of TIMSS includes a basic set of investigations, and participating educational systems will be free to select one or more of the investigations and a number of international options. TIMSS will focus on the teaching and learning of mathematics and science at three levels of the school system: the grade or level at which most students attain the ages of nine and thirteen and the grade or level at which most students are completing the last year of secondary education. One of the studies for the latter population will concentrate on an investigation of the scientific and mathematical attainments of students completing secondary school with some degree of specialization in either mathematics or science.

The conceptual model for TIMSS was derived in large part from the models used in earlier IEA studies (especially the Second International Mathematics Study and Second International Science Study), modified and updated to meet the particular demands of the present study. Fundamental to the design of TIMSS is the centrality of curriculum as a variable. Also fundamental to the design of the study is the relationship between science and mathematics as separate, yet linked, components of that curriculum.

The TIMSS curriculum frameworks are designed to provide rich descriptions of the intended curriculum, ones that can also be used in the development of achievement items. The TIMSS frameworks are powerful organizing structures that are both flexible and sophisticated. The multi-aspect, multi-category nature of the frameworks enables the description of traditional as well as reform-oriented curricula, providing dynamic ways of characterizing curricula internationally. The development of the TIMSS curriculum frameworks in analyzing curricula will help provide new insights into curriculum development internationally.

***Participants*** About 50 educational systems from all regions of the world and at all levels of economic development will participate in TIMSS. Participation from developing nations is encouraged by several agencies, IEA headquarters, and the TIMSS International Coordinating Center. Efforts are being made to provide appropriate opportunities for meaningful involvement by the educational systems in these nations.

***Sample***

Achievement test booklets for Populations 1 and 2 were piloted to students in grades three, four, seven, and eight. Fifty-two countries piloted the instruments. In the United States the pilot study involved twenty-seven schools and 3,000 elementary and middle school students from California and Michigan. A concerted effort was made to identify school systems in rural, suburban, and urban settings.

In the United States the teacher questionnaires were piloted to a convenience sample of 50 Population 1 teachers and 50 Population 2 teachers. The appropriate version of the school questionnaire was piloted among 25 principals representing all the populations at which a country is participating (in the U.S. -- Populations 1,2, and 3).

Countries provide sampling information to the international study director for review and approval. Statistics Canada continually advises national research coordinators; it has prepared a third version of the sampling manual.

***Procedures and Summary of Content*** The major source of data on student achievement in mathematics and science for TIMSS will be from achievement surveys containing multiple-choice items selected on the basis of their relationship to the mathematics and science curriculum frameworks developed for the study. The item pool for the achievement surveys is constructed so as to include items designed to measure cognitive behaviors at all levels, and also contains some free-response items, including short answer and extended response, as well as performance tasks. Questionnaires designed to elicit information about student and teacher backgrounds will be included for descriptive comparisons and to act as controls for multivariate analyses. School and classroom variables, including school climate, opportunity to learn, and time on task, will be investigated in a variety of relational analyses to be conducted.

In addition to the main study, two international options have been proposed. One international option for participating educational systems will be concerned with an in-depth investigation of students' problem-solving strategies. A second option will examine the linkage between teaching practices and changes in student achievement and attitudes.

U.S. TIMSS field test and main study data collections: Westat is responsible for production of questionnaires and assessments, receipt and processing of completed instruments for the spring 1994 field test and spring 1995 main data collections. Westat will receive support from National Computer Systems in these activities. Educational Testing Service will also assist by reviewing instruments and materials and collaborating with Westat in data analysis activities.

U.S. TIMSS state-level: States who desire to compare the achievement of their students to that of other nations participating in TIMSS have an opportunity to contract with Westat to participate as a "mini-nation" in the TIMSS data collection. Such states will administer the full TIMSS assessments and background questionnaires to a random sample of students in their states. Key features of U.S. State TIMSS are:

- Assessment scores collected through State TIMSS can be compared reliably to international TIMSS scores.
- Data will include both mathematics and science scores.
- States will have the choice of assessing their 3rd-4th, 7th-8th, and/or 12th-grade students.
- States will receive internationally comparable student, teacher, and school data from TIMSS background questionnaires.
- Reports are scheduled to be available in December 1996.
- States will be responsible for funding their own participation in State TIMSS.

The State TIMSS program is now available for participation. Details of the design options and costs can be obtained from Westat.

U.S. TIMSS case studies of education policy issues in the United States, Japan, and Germany: Year-long case studies in ministries, schools, and homes in three countries will supplement the data from the main study about four topics relating to opportunity-to-learn issues: teacher working conditions, the implementation of standards, how ability differences are dealt with, and the role of school in adolescents' lives.

U.S. TIMSS videotapes of classroom instruction in the United States, Japan, and Germany: Videotapes will be used to provide observations of mathematics instruction in a subsample of 100 eighth grade classrooms participating in TIMSS. These observations will provide both quantitative data and qualitative descriptions of how instruction occurs in these countries.

***Data Collection and Analyses***

In May 1993 the United States participated in the TIMSS Achievement Item Pilot by piloting student test booklets in over 25 schools. More than 3400 students from California and Michigan completed booklets (twelve different booklets [six mathematics and six science at Population 1] and twenty booklets [ten mathematics and ten science booklets at Population 2]. The U.S. National Center coordinated all aspects of the U.S. pilot including recruiting and communicating with school district personnel, publishing and distributing pilot booklets, and entering and cleaning pilot data. Data was sent to the IEA data processing center; preliminary data summaries were forwarded to national research coordinators.

The U.S. National TIMSS/Survey of Mathematics and Science Opportunity Center is directing development and production of the context questionnaires. The final pilot forms were submitted to the International Coordinating Center for use in the October-December 1993 Teacher and School Questionnaire pilot in participating countries; the revised version of the Student Questionnaire was used in the March 1994 International Field Trial. The Center was also responsible for writing the Pilot Manual, Administration Manual, and Data Code books for the international pilot. The U.S. National Center is coordinating all aspects of the pilot and is coordinating revision of the questionnaires following the pilot.

The Technical Advisory Committee met in July 1993 in Melbourne, Australia to discuss the continued development of the data analysis plan for TIMSS.

National research coordinators met in Frascati, Italy in October. Their agenda included discussions and presentations on the Populations 1 and 2 item pilot results and plans for the field trial operations. The national research coordinators reviewed Subject Matter Advisory Committee suggestions for Populations 1 and 2 item improvement. Educational Testing Service modified the items and assembled the items into booklets for the Field Trial. The TIMSS field test was conducted February - March 1994; in the United States Westat and its subcontractors were responsible for this activity. The data collection materials used included 8 two-part, pencil-and-paper assessment booklets for each population (provided by the IEA international coordinating center) and the U.S. versions of the student and teacher background questionnaires (provided by the U.S. National Research Center).

The Australian Council for Educational Research, with the aid of Stanford Research Institute International and many individuals, worked to develop appropriate tests for Population 3. There will be a mathematics test, a science test, and a computer literacy test for the general part of Population 3 and advanced tests for mathematics and physics specialists.

A special working group was established to assist the National Foundation for Educational Research in developing performance assessment tasks and scoring rubrics. They met in London in February to select the items.

Performance assessments were conducted March - April 1994: in the United States groups of eight students in each of eight schools for Populations 1 and 2. Field test data collection for twelfth-grade students was then conducted April - May. It involved pencil-and-paper assessment of 50-60 twelfth grade students in each of 20 schools. Statistics Canada will review and evaluate field trial operational procedures.

The procedural forms completed by participants in the field trial activities will be reviewed with the objective to determine each participant's ability to provide the necessary information and to determine how well current procedures work.

Data from the teacher and school questionnaire pilot was sent from participating countries and is being analyzed. In addition to this quantitative data, large data bases have been created containing the free responses of questionnaire respondents and the evaluative comments made by the national research coordinators regarding specific items on the questionnaires and the pilot in general. Selected National research coordinators met in June 1994 to recommend and implement revisions of the school and teacher questionnaires.

TIMSS assessments and questionnaires and administration procedures will be revised in preparation for the main study in spring 1995.

As of April 1994, the TIMSS curriculum analysis had entered its analysis phase. As of March, document analysis data from over 830 documents from 45 countries had been entered into the data base. A comprehensive series of meetings with curriculum specialists and research methodologists resulted in the design of a variety of innovative analytical techniques for this component of TIMSS. This represents a major breakthrough in the comparative analysis of curricula and represents the first in what are expected to be many innovations arising from this ground-breaking component of TIMSS. Publication of the analysis in international reports is scheduled for late 1994-early 1995. The focus of the first report will be on the provision of educational opportunity through the intended curriculum and will closely examine commonalities and differences in curricula, with particular attention given to the empirical description of a world core.

Field Trial data cleaning and preliminary analysis will be done in Hamburg; scaling will be done at the Australian Council for Educational Research.

An international working group on context questionnaires met in Washington, D.C. in May 1994 to refine the school, teacher, and student questionnaires. At this working meeting, they reviewed and discussed the questionnaires that had been rearranged and reformatted to improve their clarity at the Australian Council for Educational Research. Final recommendations were then made regarding the questions that would be used in the piloting of the school and teacher questionnaires and revisions were made in the student questionnaire.

In October 1994 an international meeting was held at the U.S. National Research Center to examine initial data analysis results and to develop strategies for data analyses and reporting as well as additional data collection for the TIMSS curriculum analysis.

The Technical Advisory Committee met in May 1994 to discuss Population 3 definition and sampling, student-teacher linkages, "below the line" definitions, field trial data analysis, management issues, the

handling of missing responses during analysis, operations issues, strategy for main survey item selection and performance assessment data analysis.

Members of the recently established international Free Response Item Coding Committee met in April-May for preliminary discussions on the development of a coding strategy for extended response items and performance assessment tasks. In response to concerns about the definition and sampling of Population 3, the United States and France co-sponsored a meeting of selected individuals to address these issues. A group of selected national research coordinators met in early June to revise the teacher and school questionnaires. The Subject Matter Advisory Committee will meet in July to select candidate items for the main survey test booklets. National research coordinators will meet in August 1994 for selection of the Populations 1 and 2 main survey instruments.

In 1993 and 1994 the U.S. national research coordinator, staff, and team of experts made presentations at meetings of the American Educational Research Association, the American Association for the Advancement of Science, National Association for Research in Science Teaching, Comparative and International Education Society, and National Science Teachers Association, and at the Council of Chief State School Officers Conference on Large Scale Assessments on:

- international curriculum analysis
- design issues for TIMSS
- measuring learning opportunities and instructional practices in mathematics and science in large-scale surveys
- development of teacher questionnaires
- what states can learn from TIMSS
- development of a model for the international study of learning opportunities
- use of observational research in the design of items for cross-national measurement of lesson structure
- development and validation of instruments for assessing opportunities to learn
- empirical analysis of intended curricula for a cross-national study of mathematics and science
- preliminary results from TIMSS
- international mathematics and science curricula
- international study of opportunities to learn
- cross-national measurement of opportunities to learn in mathematics and science
- world-class standards

In 1994 the Board on International Comparative Studies in Education organized a session on TIMSS for the American Association for the Advancement of Science meeting. Papers were presented and discussed on evaluation of international comparative studies, TIMSS design, what is expected to be learned from TIMSS, and international mathematics and science curricula.

Also in 1994 two books produced by the Survey of Mathematics and Science Opportunity at Michigan State University were published by the TIMSS International Coordinating Center at the University of British Columbia. Test Blueprints: A Description of the TIMSS Achievement Test Content Design presents the specifications for the TIMSS student test. It details the testing time and number of items to be allocated for specific framework categories and the various question types that will be used. TIMSS Educational Opportunity Model: Detailed Instrumentation and Indices Development describes how the data from the context questionnaires will be used to address specific research questions. It also details some proposed analyses and the development of key indices and typologies.

*Timetable*

1991 The Sampling and Methodology Committee met in Vancouver. (June)
National research coordinators met in Vancouver. (August)
The international steering committee met in Washington, D.C. (May)
The working group on alternative assessment met at the University of British Columbia. (May)
The Australian Council for Educational Research hosted a conference on assessment in mathematics at the elementary, secondary, and pre-tertiary levels. (November)
Mathematics and science curriculum frameworks were developed.
Preliminary topic trace and document analysis data of mathematics and science curricula were obtained from 30 countries.
Methodology for the study was developed.

1992 The Subject Matter Advisory Committee met in Vancouver. (January)
National research coordinators met. (March)
Curriculum frameworks were distributed to participating educational systems.
Student assessment items were collected.
Document analysis and topic trace coding were conducted.

1993 The Subject Matter Advisory Committee met in Vancouver. (January)
The International Steering Committee met in Vancouver. (February)
National research coordinators met in Vancouver. (March)
The U.S. National Center/SMSO directed development and production of context questionnaires. Final pilot forms were used in the October international Teacher and School Questionnaire Pilot.
The field test was conducted. (February-May)
An international working group on context questionnaires met in Washington, D.C. (May)
The Technical Advisory Committee met in Melbourne, Australia. (July)
The U.S. Steering Committee met twice in Washington, D.C. to discuss performance testing, achievement test, sampling, and preliminary curriculum analysis data. (May and November)
National research coordinators met in Frascati, Italy. (October)
Field trials of instruments for all populations were conducted in the southern hemisphere.
Presentations were made by the U.S. national research coordinator and others at AERA, CIES, NARST meetings and a CCSSO conference.

1994 A special working group established to assist NFER in developing performance assessment tasks and scoring rubrics met in London. (February)
A Field Trial data analysis plan was drafted. (March)
The revised version of the Student Questionnaire was used in the April International Field Trial in the northern hemisphere. Data will be submitted to the University of Hamburg in June.
Three books were published.
Document analysis data was collected and analyzed.
U.S. Phase 1 quality control activities were completed: data was cleaned and assembled for the international curriculum analysis.
An international meeting was held at the U.S. National Research Center. (October)
The Technical Advisory Committee met in Boston. (May)

The Free Response Item Coding Committee met in Boston. (April-May)
The United States and France co-sponsored a meeting in Washington, D.C., to discuss Population 3 definition and sampling. (May)
Selected national research coordinators met in Hamburg to revise teacher and school questionnaires. (June)
The Subject Matter Advisory Committee will meet to select candidate items for main survey test booklets. (July)
National research coordinators will meet in Boston for selection of Populations 1 and 2 main survey instruments. (August)
U.S. State TIMSS is available for participation.
Presentations were made by the U.S. national research coordinator and others at AERA, AAAS, NSTA, and NARST meetings and at a CCSSO conference.
The Board on International Comparative Studies in Education organized a session on TIMSS for the AAAS meeting. (February)
Phase 1 main data will be collected for all populations in the southern hemisphere.
The TIMSS Encyclopedia (1st edition) will be published, to serve as a reference text for all aspects of the study.
The document analysis international report will be published.

1994-1995

International reports will be published on curriculum analysis.

1995 Phase 1 main data collection will be conducted in the northern hemisphere. (spring)
The TIMSS Encyclopedia (2nd edition with updated information) will be published.

1996 Phase 1 main data will be cleaned; data banks will be created.
Reports of U.S. State TIMSS are scheduled to be available. (December)
Phase 1 main data collection international report will be published.
Phase 2 will be designed and developed.

1997-2000

Phase 2 main data will be collected.
Phase 2 main data will be analyzed and reported.

***Publications***

TIMSS curriculum analysis: Topic trace mapping. In Prospects. By William H. Schmidt. UNESCO.

Curriculum Frameworks for Mathematics and Science. TIMSS Monograph No. 1. Pacific Educational Press, Vancouver, Canada. (1993)

Test Blueprints: A Description of the TIMSS Achievement Test Content Design. University of British Columbia, Vancouver, Canada. (1994)

TIMSS Educational Opportunity Model: Detailed Instrumentation And Indices Development. University of British Columbia, Vancouver, Canada. (1994)

TIMSS Encyclopedia (1st edition, and 2nd edition with updated information) will be published.

A document analysis international report will be published.
The first TIMSS reports dealing with international comparisons of student outcomes are scheduled for publication in late 1996. International and national reports are proposed on U.S. and international pre results, curriculum, Survey of Mathematics and Science Opportunity, and survey results.

A Phase 1 main data collection international report will be published.

***Database***

At this time, the information that has been gathered for TIMSS is not public information. It will be a year or two before this information can be released.

***Funding*** Funding is provided by the National Science Foundation, in cooperation with the National Center for Education Statistics, for the U.S. National Research Center at Michigan State University. U.S. states that participate in state TIMSS will be responsible funding their own participation.

***Information Sources***

Albert Beaton, Study Director
Center for the Study of Testing, Boston College
Campion Hall, Room 320
140 Commonwealth Ave.
Chestnut Hill, Massachusetts 02167-3807
telephone: 617/ 552-4521
facsimile: 617/ 552-8419
e-mail: beatonal@hermes.bc.edu

David F. Robitaille, International Coordinator
University of British Columbia Department of Mathematics and Science Education
2125 Main Mall
Vancouver, British Columbia, CANADA V6T 1Z4
telephone: 604/ 822-5337
facsimile: 604/ 822-4714
e-mail: David_Robitaille@mtsg.ubc.ca

Robert Garden, Deputy International Coordinator
University of British Columbia Faculty of Education
2125 Main Mall
Vancouver, British Columbia CANADA V6T 1Z4
telephone: 604/ 822-9136
facsimile: 604/ 822-8571
e-mail: npc@timss.ubc.ca

International Coordinating Center
University of British Columbia Faculty of Education
Vancouver, British Columbia, CANADA V6T 1Z4
telephone: 604/ 822-9136
facsimile: 604/ 822-8571
e-mail: TILMSS_ICC@mtsg.ubc.ca

William H. Schmidt, National Research Coordinator
463 Erickson Hall
Michigan State University College of Education
East Lansing, Michigan 48824-1034
telephone: 517/ 353-7755
facsimile: 517 432-1727
e-mail: wschmidt@msu.edu

Lois Peak, U.S. TIMSS Project Officer (contract activities)
National Center for Education Statistics
555 New Jersey Avenue, Room 304-C
Washington, D.C. 20208
telephone: 202/ 219-2195
facsimile: 202/ 219-1736

Sandra Reider
Westat, Inc.
1650 Research Blvd.
Rockville, Maryland 20850
telephone: 301/ 738-3616
facsimile: 301/ 294-2038
(details of U.S. State TIMSS design options and costs; mailing list; periodic updates on the status of State TIMSS)

International Association for the Evaluation of Educational Achievement (IEA) Secretariat
c/o SVO
Sweelinckplein 14
2517 GK The Hague THE NETHERLANDS
telephone: 31-70-346-96-79
facsimile: 31-70-360-99-51
e-mail: iea@svo.nl

Gordon M. Ambach, U.S. Liaison to IEA
Council of Chief State School Officers
One Massachusetts Ave., N.W., Suite 700
Washington, D.C. 20001-1431
telephone: 202/ 408-5505
facsimile: 202/ 408-8076
e-mail: gambach@nas.edu

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Beaton, Albert

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Gilford, Dorothy M., Daniel G. Horvitz, Ronald K. Hambleton, Albert E. Beaton, David E. Wiley, Richard Wolfe, William H. Schmidt, and Donald B. Rubin.

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1994 International Mathematics and Science Curricula. Presented on the panel on The Third International Mathematics and Science Study at the American Association for the Advancement of Science meeting. February.

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1993 New Trends in the Cross National Comparison of Curricula. Panel with papers presented. March. Kingston, Jamaica.

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U.S. TIMSS National Research Center

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NOTE: This study summary was reviewed and edited by William Schmidt at the U.S. National Research Center for TIMSS at Michigan State University on July 10, 1994; Schmidt provided database information on November 29, 1994.

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